DRAGON USER



The independent Dragon magazine

95p US$3.25 June 1985

Arcade game classics



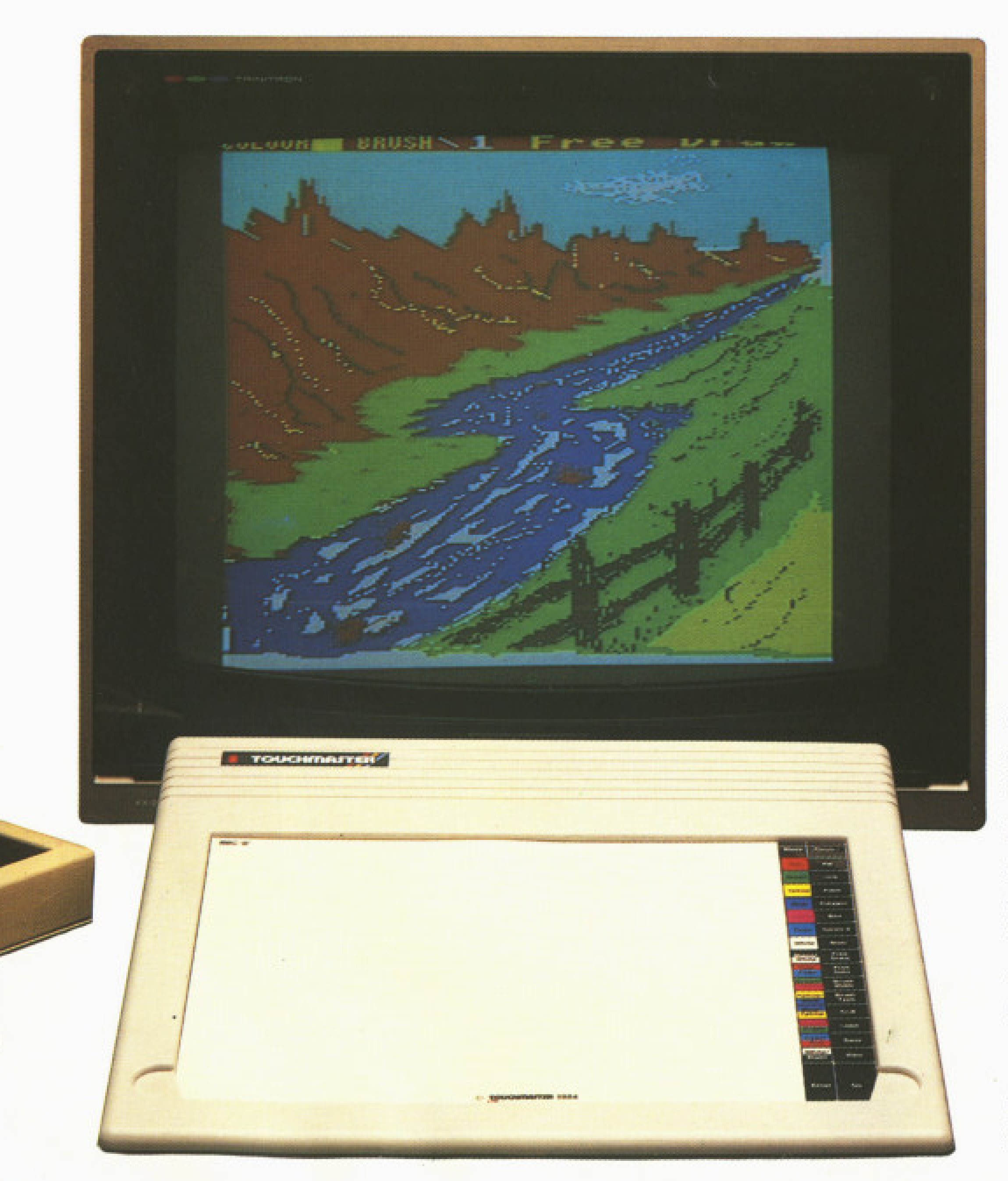
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How to submit articles

The quality of the material we can publish in *Dragon User* each month will, to a very great extent depend on the quality of the discoveries that you can make with your Dragon. The Dragon computer was launched on to the market with a powerful version of Basic, but with very poor documentation.

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should, whenever possible, be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Contents





Editorial

DRAGON SOFTWARE will become increasingly more difficult to find in the high street in the near future.

Webster's Software, one of the country's leading distribution companies, has just taken the decision to pull out of the Dragon software market.

As more and more new micros appear in the shops, there will be less and less space to provide software for those machines that have been discontinued — even if, like the Dragon, they come back to life again.

Obviously Websters — and other companies — no longer believe that there is sufficient demand for Dragon software to make it worth their while carrying it.

Similarly, it is becoming increasingly more difficult for people to find other forms of support for their Dragons — the main one being, of course, repair facilities.

A great many otherwise loyal Dragon owners will be forced to desert the machine of their choice if a new service network is not organised soon.

However reliable the Dragon and the 6809 chip is, machines do break — and if there is nobody who can mend them, they will stay broken.

Eurohard has announced plans for the future which include the promise of wonderful new machines. The Dragon MSX machine at least has actually appearaed. But surely one major priority should be to make sure that the existing Dragon user base in the UK can survive by organising a chain of repair agents?

There are still many people out there with Dragons. The circulation of this magazine alone should be proof of that.

There are still plenty of very impressive products being put out as well. It would be a shame — more, a tragedy — if the Dragon collapsed again because there was no one to put them back together again.

Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Stopping I/O errors

I AM writing about the article "Eradicating I/O Errors" in your August issue. I recently tried to alter my cassette recorder as shown, as I also have a Dixon TR12. As I couldn't understand it, I took it along to my friendly TV repair man, as suggested.

He couldn't figure it out either, until he worked out that the point the writer called A was actually point B in his photograph, and point B was point A. The 'white' lead coming from the negative end of the motor was actually black on our recorder. Although the photograph shows a point E, you don't need to alter that at all.

The instructions given in the article are correct as long as you take note of the changes above. I have now had my recorder changed and it works perfectly.

S N Jones
Eye
Suffolk

Moneybox corrected

THANK YOU for your excellent review of our *Moneybox*-disk program. May I make two small points? Your reviewer feels that the keyboard delay time is too short. For some time now, copies of *Moneybox* have incorporated a routine to allow users to alter the keyboard response rate to suit themselves. This has been added to the section allowing users to change the screen background colour, and to have the drive(s) on continuous run.

Secondly, I cannot agree that spreadsheet programs are more useful for this sort of work. While spreadsheets are more versatile, especially where "what if" exercises are concerned, they do not provide any sort of transaction listing. This can be essential for checking statements, income tax, VAT and so on. I doubt if your reviewer would appreciate a bank statement that only gave a final balance, without showing how this total was arrived at!

Bob Harris
Harris Micro Software

Coventry club?

WOULD ANY of your readers in the Coventry district be interested in forming a loose association of Dragon Users? I have searched all sources but no such group exists in this area.

I do not envisage a club, with club fees and so on, just a central address where interested people with Dragons or CoCos could obtain other people's addresses and cross correspondence could take place. Perhaps if they indicated special interests and the initiator of correspondence enclosed an SAE, the costs to individuals would be kept to a bare minimum.

Wolf S Jagodic
Binley Village
Coventry

Manic Miner

I RECENTLY discovered that to get infinite lives on *Manic Miner* you should type CLOADM"", 1298 and load *Manic Miner*, then type POKE &H38C4,&H8E. Then save the game by typing CSAVEM"MINER", PEEK(487)*256+Peek(488), PEEK(126)*256+PEEK(127)-1, PEEK(157)*256+PEEK (158).

Once the game has a saved re-load it by typing CLOADM"", 64238.

The game will then load starting from the colour codes.

After trying out this new copy you will find there are two extra screens — Dragon Users Bonus and the End.

The Fifty Quid Kid
Birmingham

Penguin

IT MAY interest readers who have bought the excellent *Manic Miner* by Software Projects that access to all the screens is possible upon typing in the word. 'PENGUIN'.

The famous boot will appear bottom right of screen if successful (timing the entry of the 'P' is awkward — try not to pause the game).

Thereafter BREAK plus a letter from A-V will allow access to any screen.

William Sunderland
Ambleside
Cumbria

Pokes!

I HAVE decided to put print head to paper and reply to two letters in the March issue. In answer to Mr J Harrington letter the location that controls the upper-lower case is &H149 or 329,255 gives upper case only.

Now the *Manic Miner* multi-lives I am unable to help with, but I thought that it would be a good idea to start a regular Hackers column, so here are a few to start with. *Donkey King* Poke 12914,n: *Invasion* Poke 7438,n: *Invaders Revenge attack MK1* POKE 10739,n, *attack MK1* Poke 10739,n where n can be up to 255 decimal.

One for all the readers who wish to slow listings: Poke 359,60 will enable you to read a listing and Poke 359,57 to return to normal. Try Poking 359,76 and you get unpredictable results, but the program still works.

T O'Brien
Banbury

Charts

YOU ASKED for other readers' views in reply to the letter by W Miles (*Dragon User*, April, 1985) regarding the validity of Popularity Charts for Dragon games. I fully agree with the ideas put forward and endorse the view that a readers' poll would more accurately indicate the situation. The present system of assessment whilst even taking into account the direct sales of several leading software houses plus shop sales fails to indicate the views of those amongst your 35,000 readers who acquire their games by means other than those outlined.

Anthony J Boddy
Bolton

Right on

THANK YOU for publishing my program, *King of the Hill*, in January's issue of your magazine.

Since publication I have recieved a few letters and telephone calls from your readers concerning a huge array of error calls.

I would like to assure your readers that the published listing is perfect and fully operational. I have personally typed in the game from the published listing and have found it to be correct.

Philip Thompson
Sentinel Software

Slapped wrist

I AM writing, in part, to agree with the slapped wrist you suffered at the hand of Compusense. I have had a Dragon for over 2.5 years (a 32 when it was first hatched and more recently a 64) I also have a single drive and a printer, but then so do many other Dragon owners.

How could we possibly conduct a comparison of our own when so many of us know so little of Flex or OS-9?

Yes Compusense was right, your article was inadequate and not impartial, but Compusense sell both operating systems and are very familiar with them. Instead of giving *Dragon User* slapped wrists why did they not offer an article explaining the features and differences of both OSs?

Dragon owners know they have an extremely powerful computer but it must be up to those with more knowledge to help the rest of us. If articles were donated from interested parties (they would probably sell more to a more enlightened user) then the pages of *Dragon User* would probably grow in number and make some attempt to justify the high price of 95p. As about half the contents of the magazine is devoted to advertisements, the price should be less.

Anthony H North
Shipley
West Yorkshire

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Websters drops Dragon software

WEBSTERS' Software, one of the biggest distribution companies in the country, has stopped handling Dragon software.

This means that games for the 32 and 64 will become even more difficult to find in high street stores.

The situation from the high street stores point of view was summed up by Peter Frost, Boots' Assistant Merchandise Controller, who said that his company would continue to sell software for the Dragon computer for as long as there was sufficient demand to justify it.

"There is of course less room to carry software for discontinued machines, but we still have a limited range in our full specialist stores, which are the top 150 stores in the Boots group," he said.

Websters has sold its stocks of Dragon software to John Penn Software, which is offering it at reduced prices by post.

John Penn Software is at Dean Farm Cottage, Kingsley, Bordon, Hants GU35 9NG.

Games group

THE DRAGON Games Users Group is a new organisation designed to appeal to Dragon owners who enjoy playing games, according to founders Oron Software.

The new club will offer substantial discounts on games from a number of well-known software houses. There will also be a bi-monthly news letter which will feature reviews, playing tips, and an adventure helpline.

Although Oron Software is a commercial company producing various products for the Dragon, Mark Blease, the company's founder, promises that the DGUG will be kept totally separate.

"We are not using DGUG as another commercial venture," he said. "We aim to spend every penny of the membership fee on our members."

Membership of the DGUG costs £5.00 per year, and further information can be got from Oron Software, 64 Prince Street, Rochdale, Lancs OL16 5LJ.

Printer Control

MACGOWAN Consultants is a newly formed software house with a word processing package for the Dragon 32 and 64.

Printer Control gives the user access to a wide range of commands, including the ability to design character sets, write over graphics, mix text and graphics printing in the same line and much more.

William MacGowan, who set up the company with help from the Enterprise Allowance Scheme, has written software for various machines. He believes that the major selling price of *Printer Control* will be its price.

"At £15," he says, "it has all the commands of much more expensive word processing packages, and more besides."

MacGowan Consultants can be contacted at 6 Arnhem Drive, Caythorpe, Nr Grantham, Lincs NG32 3DQ.

Diamond's return

SALAMANDER Software has two new releases for the Dragon — both text only adventures.

Franklin in Wonderland is the fourth in the Dan Diamond trilogy, according to Salamander spokesperson, Lucinda Parker.

The White Cliffs of Dover is a sequel to the Second World War adventure *Wings of War.*

Both games have apparently around 120 locations, and will cost around £5 from Salamander Software, 17 Norfolk Road, Brighton, East Sussex BN1 3AA.

Dragon MSX

THE DRAGON MSX machine has finally made an appearance.

The machine, manufactured by Hong Kong based Radofin for Eurohard, the Spanish company which now makes the Dragon, conforms to the usual MSX standards.

It will be marketed in Europe by Eurohard, who took over the MSX licence originally granted to Dragon Data and GEC. No details on price have been released yet.

As a standard MSX machine, it will of course use the Z80 processor and will be totally incompatible with existing Dragon machines.

Dream

READERS who have been interested by the Dream editor assembler mentioned in some of Pam d'Arcy's articles in past *Dragon Users,* might like to know that it is now available as *Alldream,* from Grosvenor software.

Alldream includes a monitor and disassembler, and is available on tape or cartridge for the Dragon 32/64. It can also be bought on disk for Dragon Dos.

Scott Adams

FOR ADVENTURE lovers, the name of Scott Adams ranks amongst the greats — so if you read Mike Gerrard's adventure trail first every month, you will be delighted to hear the news that all of Scott Adams' adventures are now available for the Dragon from Adventure International in Birmingham.

The Classic Adventure series from 1 to 13, plus *Spiderman* and *THE HULK,* the first two games in the Questprobe series, based on Marvel Comic characters, cost £7.95 and are text only.

In addition, adventure International is selling the entire Mysterious Adventure range, originally released by Channel 8. Adventure International UK is at 85 New Summer Street, Birmingham B19 3TE.

Disk error

WE MADE an eror in last months Dragon DOS article by Phil Brooks. The first patch should read

Patch: +00BF 97

The 97 was unfortunately missed out.

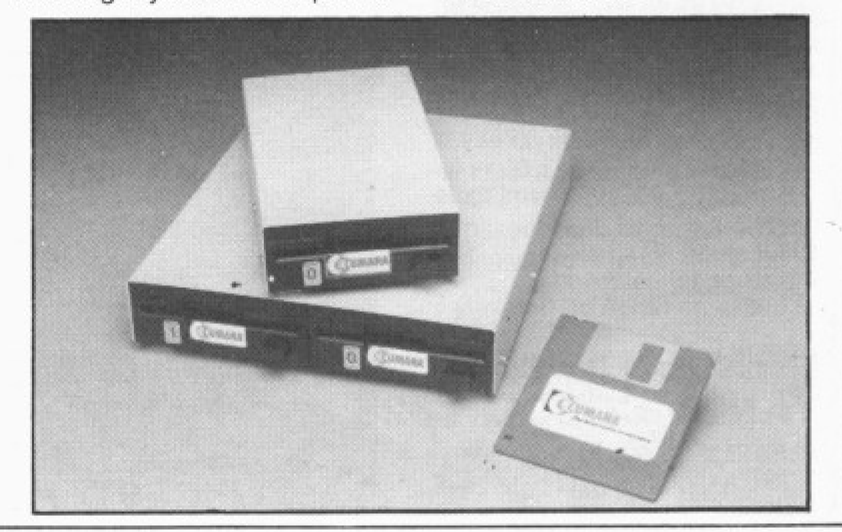
Dragon 3" drives

CUMANA has announced the launch of a new range of 3½" disk drives for the Dragon.

The disk drives range from a single-sided 40-track drive to a dual-drive with two 80-track drives. Storage capacity ranges from 125 kilobytes at the bottom end of the range to two megabytes at the top end.

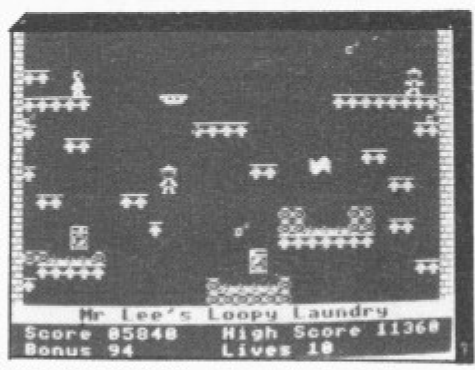
Cumana can supply interfaces and connectors to enable the drives to be used with the Dragon computer and a number of other leading micros as well.

For more information, write to Cumana, Pines Trading Estate, Broad Street, Guildford GU3 3BH.



NEW GAMES FROM BLABY COMPUTERS

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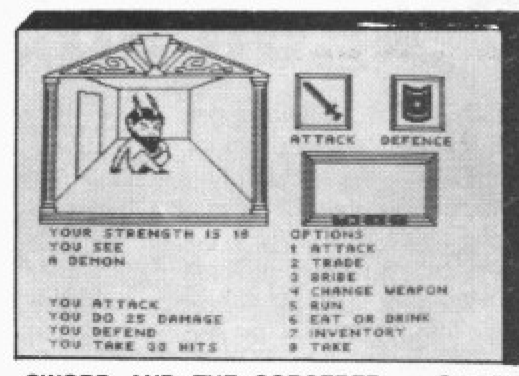


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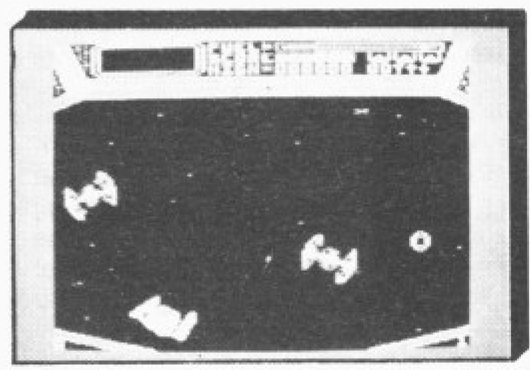
FINGERS

If you fancy yourself as a safe-cracker then read on. Thirteen screens of disappearing floors, conveyors and will you find out for yourself. Help light-fingered Fred to collect his golden keys to open each safe. JS

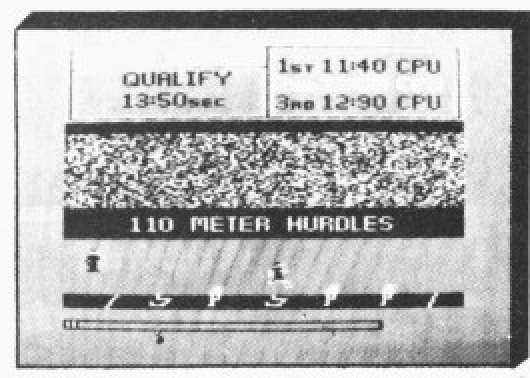
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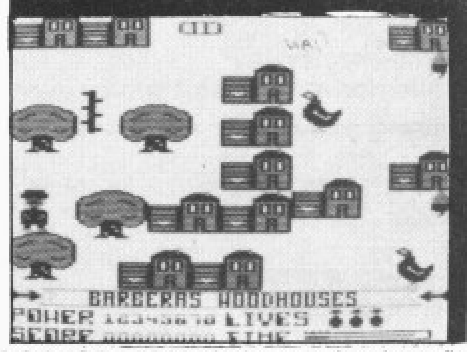
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DRAGON 32 £3.99 TANDY £3.99



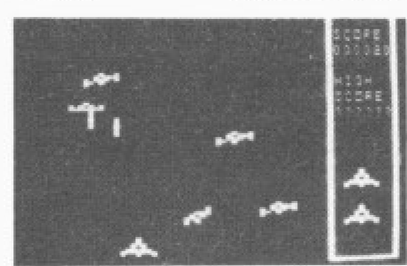
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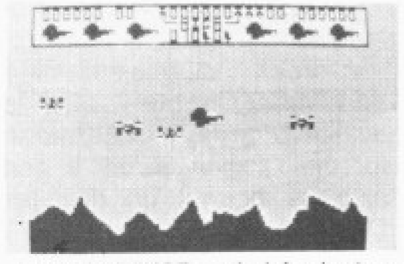
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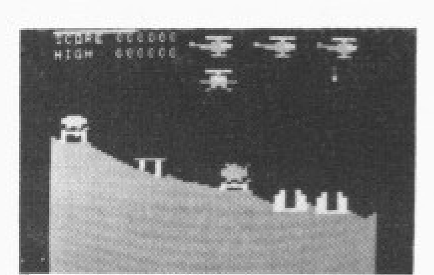
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DRAGON 32 £3.99



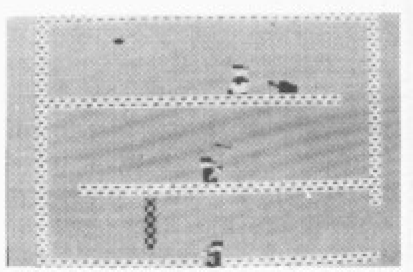
STAR SWOOP — Eliminate the Zargon fleet, wave after wave of them, they never stop you will give in before they will, they are invincible. Fantastic sounds and graphics. KB.
DRAGON 32 £1.99
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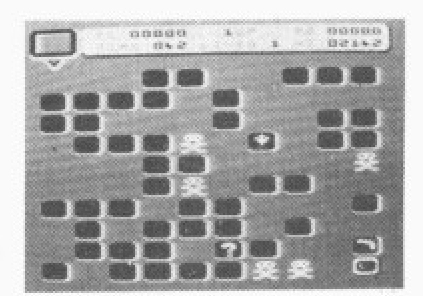
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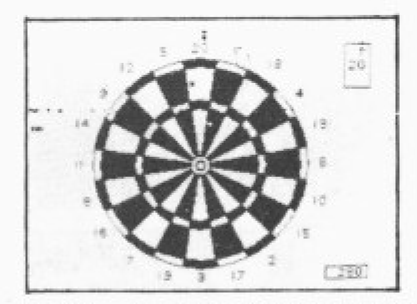
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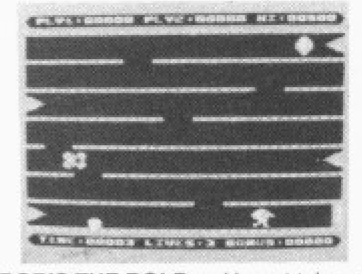
DESPERADO DAN — Desperado Dan was a guest of Her Majesty's Prison, that was until his timely escape. Help him get back to where he hid his loot, but no one had told him a supermarket had been built over it. JS.
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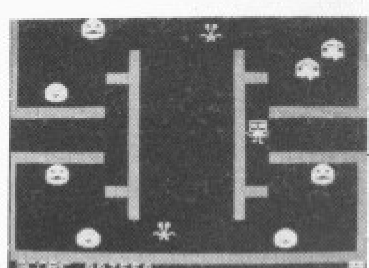
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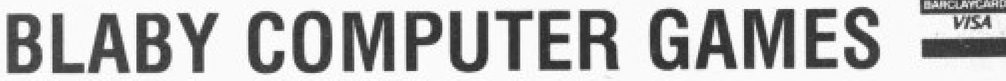
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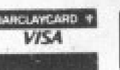
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Arcade addiction!

In a special review section **Jason Orbaum** *looks at some classic arcade games for the Dragon*

The King of the arcade

Program: *The King*
Supplier: *Microdeal*

ANY SERIES of reviews of classic Dragon arcade games has to start with this, possibly the best Dragon game in the world.

The arcade game is *Donkey Kong,* a game in which you play Mario, the carpenter, who is trying to capture King-Kong himself by running along a series of walkways, climbing a series of ladders, and avoiding barrels, fireballs and the mega-monkey himself.

The King, released long ago in the mists of time has still never been graphically surpassed, and is quite simply the best version of *Donkey Kong* available for ANY microcomputer.

There is the usual choice of screen colour, along with options for normal or slow speed, one or two player games, and three lives or twelve (with twelve lives the player's score is not eligible for the high score table, which, incidentally, is done in true arcade style).

The game looks great, and handles better than any other on the market. But then, I feel that I'm preaching to the converted as, judging by the number of months the game held the top of the software charts, every Dragon owner in Britain probably owns a copy!

Manic Miner

Program: *Manic Miner*
Supplier: *Software Projects*

THIS GAME never made an appearance in the arcades. The original (written for the, spit, Spectrum) was written by Matthew Smith and has become one of the biggest selling games EVER released.

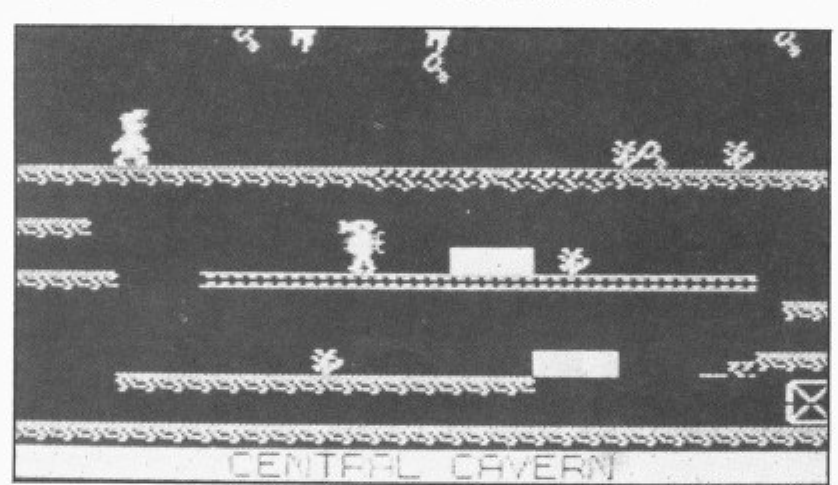
The recently released sequel, *Jet Set Willy,* is better than this game, and this game is of a very high standard indeed!!

The object of the game, for those who have been fortunate enough not to come into contact with a Spectrum for prolonged periods, is to help Miner Willy through 20 caverns (actually, the Dragon version is rumoured to have two extra screens, but I have never reached them!), collecting a variety of keys, dials, snow-shoes, and other silly objects whilst avoiding a set of equally silly creatures (the most famous of which are the man-eating toilets).

The game would be good value with four or five screens; with 20 (22?) screens it's ridiculously good value.

But those amongst you (myself included) who can go from start to end on the Spectrum version, will find a much more difficult task on the Dragon. The game, whilst undergoing translation, has been made faster and more responsive. This, coupled with the fact that old Spectrum timings and patterns do not always apply, makes it almost like playing a new game!

The game, like its excellent successor, is almost sure to become a classic, and its sales on the Dragon show that Roy Coates has taken Matthew Smith's formula and implemented it as well on the Dragon, as the latter did on the Spectrum.



Scramble

Program: *Scramble*
Supplier: *Microdeal*

ANOTHER Microdeal release, and although not one of their best games, this is still the best version of *Scramble* available for the Dragon 32 and plays almost as well as the arcade version.

The graphics are smooth if not complex, and the scrolling landscape goes by at the "correct" rate. The controls (bomb, fire, left, right, up and down) can be handled by joystick or keyboard, and the game, after the relatively short load, is gripping and addictive.

The only problem with this game is that some of the screens are disappointing copies, most notably wave three (the meteors) which I found the most difficult in the arcades.

In this version of the game however, instead of many fiery meteors hurtling across the screen we are "treated" to two meteors at a time, limping across the screen . . . gone is the need to stay low and forwards, you can actually navigate between these fireballs with surprising ease!!

All the waves are present though; the opening hills, the space-ships, the fireballs, the city and the maze to the final base. The trouble is that when you have mastered this game, it is no longer limitless, for, as difficulty increases and fuel disappears more rapidly, there is a run where it is IMPOSSIBLE to survive, even if all fuel bases are shot!!

All things considered though, it looks as though this is going to remain the best *Scramble* type game for the Dragon.



Rommel's Revenge

Program: *Rommel's Revenge*
Supplier: *Design Design*

YES FOLKS, this game was NOT written by Microdeal, and yet it is excellent. It is a version, a very well executed version, of *Battlezone,* the 3-D tank simulation that caused such a stir in the arcades a few years ago.

This version has everything that the battlezone fanatic could ever ask for . . . superb 3-D graphics, variable difficulty, a massive high score table (that you can save to show to your friends), selectable control (even down to a choice of pause key!), and joystick option.

The on-screen play is identical to the arcade version of the same game although this version is in black on green, rather than green on black.

The only things missing are the two control joysticks that adorned the console in the arcade but this is a loss that can be lived with and the new controls are just as easily mastered.

The game supports tanks, super-tanks, flying saucers, and missiles (bouncing bombs) but the background is only a straight line instead of a series of mountains.

All the usual polygons line the landscape, and it is just as easy to bump into them as it was in the arcade! The radar blips, you can hear the enemy fire and your own, and when you're hit the screen cracks beautifully.

This is quite simply a superb game, excellently programmed.



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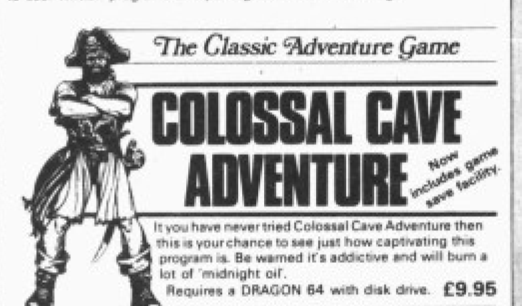
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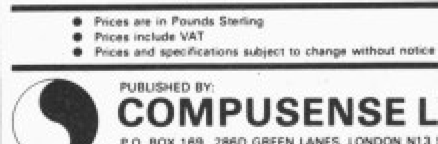
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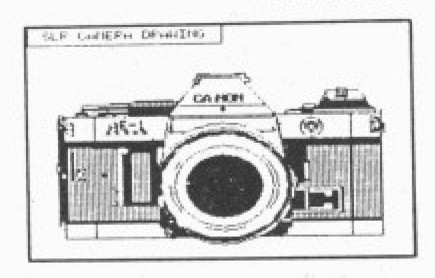
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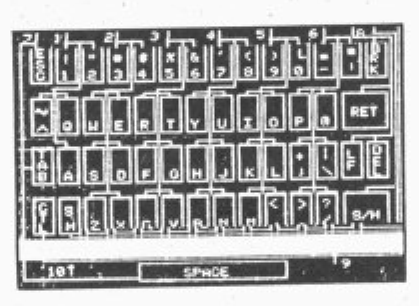
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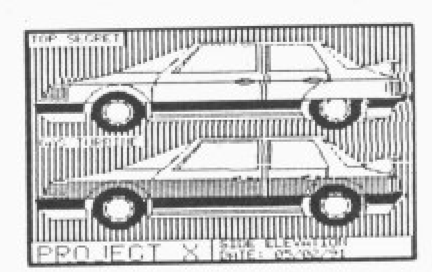
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Cuthbert

Program: *Cuthbert in the Jungle.*
Supplier: *Microdeal.*

NO SELECTION of classic games could be complete without at least one mention of the freckle faced, glasses clad, hero of the Dragon . . . I refer of course to *Cuthbert.*

This is the Microdeal (sorry folks!) version of a game originally called *Pitfall Harry* and released by Activision for the Atari VCS. The game involves running a man around a jungle avoiding logs, snakes, scorpions, fires, and lots of other things in a quest for treasure.

During the game you are sure to jump across alligators mouths, swing across pulsating pits of quicksand, and use the "secret" tunnels under the jungle.

The game is a dream for Milk-Tray fanatics everywhere and, once again, there is no shooting!

The setting (PMODE 3) is beautifully drawn, so long as you have a colour television, and the man runs, jumps, climbs and swings naturally (even if he does tend to look like a stick insect on the ladders).



The play is superb, but he prepared for your joysticks to take a hammering, especially on the buttons.

An elegant mix then of strategy and arcade, and as the game has a time limit (20 minutes, although my three lives have never lasted that long) once the game is finished, an attempt to beat your best time can be made — there is a rumour that it can be finished in 16 minutes 45 seconds, or thereabouts.

If you don't have this rather aged game, then it is well worth adding to the collection.



Frogger

Program: *The Official Frogger*
Supplier: *Microdeal*

YET ANOTHER Microdeal offering (I have a friend who believes that Microdeal are the only software house who produce games for the Dragon!), which is definitely the best *Frogger* available for the Dragon.

Frogger was a game that never really caught on in the arcades. I don't understand why, I mean, it's such a nice game, no shooting, no violent aliens self destructing, no ghosts materialising anywhere — hmm, maybe that's the reason!

This version of *Frogger* in in PMODE 1 and uses the mode better than any other I have seen. It is colourful, whilst retaining clarity and plays excellently on keyboard (I would not advise the joystick option without self centering joysticks).

The object of the game is simply to hop a frog across a busy road, and then a busier river. To cross the road is simple, just avoid the cars, lorries, and so on. To cross the river isn't so simple . . . you must ride on the backs of turtles, and on logs, and then time the jump into one of your five homes at the top of the screen.

The game has progressive difficulty, a timer, five frogs per game, one or two player option, and can play more tunes than "Duran Duran" (but then three isn't really than many!).



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1 Joystick required for light sabre fight

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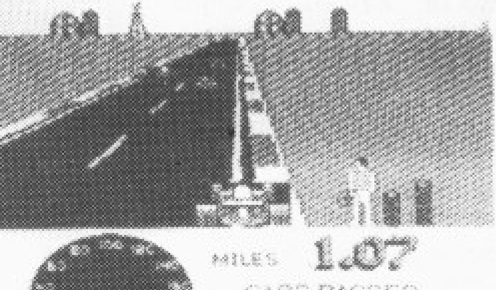
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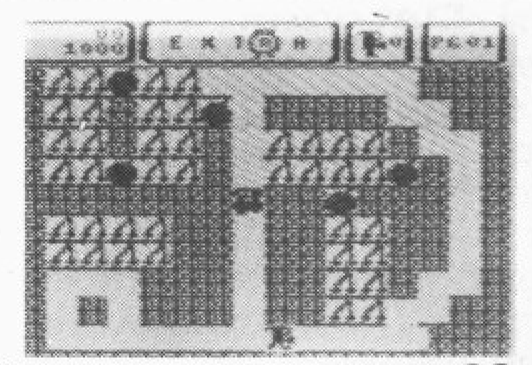
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The numbers game

***Pam d'Arcy** shows you how to handle the problems of machine code with a disassembler program for beginners*

YOU KNOW how much you can learn from other people's BASIC programs. Many useful tips can be picked up. If a program doesn't work, you can work through the listing and hopefully correct it. What happens, however, when you come across machine code articles?

The ability to translate machine code values into meaningful instructions is invaluable; should a machine code article not appear to work, to be able to cross check the accuracy of the entered program data is a great asset; a plethora of new ideas and programming techniques can be discovered and routines be adapted to suit your own needs. The translation of machine code to meaningful instructions is usually referred to as DISASSEMBLY.

Almost every value that can be held in one byte of memory (0-255; hex $00/&H00 – $FF/&HFF), either alone or in conjunction with up to the next four bytes of memory, depending upon the value, represents a particular machine code instruction. Not being machines ourselves, meaningful words are easier to remember than numbers. Motorola (the manufacturers of the chip at the heart of the Dragon) publish a list of recommended MNEMONICS, or memory joggers, for association with each machine code instruction. For example, the mnemonic for $3D (multiply) is MUL. Armed with such a list, you could assemble and disassemble manually — I didn't possess assembler software when I wrote Tapescan (February 1984 issue).

```
Listing 1
1 REM HEXLOADER WITH CHECKSUM
2 REM PAM D'ARCY (C) 1984
3 CLEAR200,12001:B=10
4 PA=128:PS=193:PC=131+(B*2)
5 DIM H(B*2),M(B)
6 CLS:PRINT"HEX LOADER PROGRAM":PRINT
7 INPUT"START ADDRESS";A
8 IF A=0 THEN END
9 CLS:C=0:E=0:PE=PS:P$=CHR$(128)
10 PRINT@PA,A;"($";HEX$(A);")"
11 PRINT@PC,"CHKSUM"
12 IF E=0 AND PE=PS+(B*2) THEN 30
13 IF E<>0 THEN PRINT@PS+E,""
14 PRINT@PE+E,P$:S=PE-PS
15 K$=INKEY$:IF K$="" THEN15
16 IF S=B*2 THEN22
17 IF K$<"0" THEN22
18 IF K$<":" THEN K=VAL(K$):GOTO21
19 IF K$<"A" THEN15
20 K=ASC(K$)-55:IF K<10 OR K>15 THEN24
21 H(S)=K:PRINT@PE,K$;:K$="":PE=PE+1:GOTO12
22 IF K$=CHR$(12) THEN6
23 IF K$=CHR$(8) AND S<>0 THEN PE=PE-1:GOTO12
24 IF E=0 THEN15
25 IF K$=CHR$(09) AND S=B*2 THEN 29
26 IF K$=CHR$(09) THEN PE=PE+1:GOTO12
27 IF K$=CHR$(13) THEN31
28 IF K$="S" THEN PE=PS+(B*2) ELSE GOTO12
29 PRINT@0,"":PRINT@PS+E,""
30 PRINT@PE,"":PRINT@PE,"";:INPUT C
31 N=0:FOR S=0 TO B-1
32 M(S)=(H(S+S)*16)+H(S+S+1)
33 N=N+M(S):NEXT S
34 IF N<>C THEN37
35 FOR S=0 TO B-1
36 POKE A,M(S):A=A+1:NEXT S:GOTO9
37 PRINT@0,"CHECKSUM ERROR - EDIT"
38 PRINT@PS+(B*2)," ";
39 E=32:PE=PS:P$=CHR$(94):GOTO12
40 REM***************************
41 REM OVERALL CHECKSUM CHECK
42 T=0:FOR N=12001 TO 15210
43 T=T+PEEK(N):NEXT N
44 PRINT T:END
45 REM***************************
46 REM RECHECK LINE CHECKSUMS
47 N=12001
48 T=0:FOR N=N TO N+9
49 T=T+PEEK(N):NEXT N
50 PRINT N-10;T
51 K$=INKEY$:IF K$="" THEN51
52 IF K$="R" THEN RUN ELSE48
```

However, the translation of mnemonic codes to machine code and vice versa is an area where the speed and accuracy of a computer really scores for us.

A beginner's disassembler

With a DISASSEMBLER incorrect values, through misprints or mistypes, can be quickly established as the display should indicate invalid codes one way or another. If a program or routine does not work and an assembly listing is provided, cross-checking a disassembly of the machine code in memory against the original will show up discrepancies. If there still appears to be no alternative but to work through the program logic, a disassembler will quickly translate the mass of numbers to an equivalent assembly source listing.

I have used three different disassemblers, and there was an illustration of the output from a further type in August's issue. Some have very good points but each have facets that I believe are a disincentive, and are even at times misleading, for newer machine coders. I therefore offer you this one with the beginner specifically in mind.

(1) It is written in machine code so can co-reside with a BASIC program and be loaded anywhere in the machine so that you are not limited on the areas of memory that can be disassembled.

(2) Unlike some disassemblers (where it is obviously expected that the user has a printer), this disassembler does not lose the end of longer lines off the screen edge.

(3) True screen paging is used — no "accidental" scrolling of lines off the top of the screen because of unexpectedly long statement lines.

(4) A completely different approach is taken concerning disassembling some particular types of instruction to try and help rather than hinder newer machine coders.

Inputting the disassembler code

The problem with any disassembler is its sheer minimum size. To combat this (both in terms of keeping the article reasonably short and assisting as much as possible with the accuracy of program entry) the DISASSEMBLER is supplied as a HEX DUMP with a CHECKSUM after every 10 bytes. A checksum has many derivations. This one is simply the sum (given and entered in decimal) of the ten preceding bytes. The BASIC HEX LOADER PROGRAM (listing 1) also contains an EDIT facility to save you having to re-enter a complete line of data for an odd slip. Any amount of data may be entered in a session, allowing you to pick up and put down program entry as suits your mood or convenience. I have chosen a load address of 12001 on the basis that this allows space for BASIC at the lower end and is also well below the area normally used for machine code.

Using HEXLOADR (listing 1)

Input the starting address for the code to be entered — 12001 or the restart point if continuing from a previous session. Input each line of the **hex dump** (listing 2) as a stream of 20 consecutive hex characters (0-9, A-F). The space character between each pair of hex characters (= 1 byte) is for easier reading and checking and is not to be typed in. After entering the last pair of characters in a line, the checksum is typed in and ‹ENTER› pressed. If the data entered agrees with the checksum, the values are POKEd into the designated memory locations and the screen prompts the next address. Pressing ‹CLEAR› at any time abandons any current line being entered and returns you to the 'START ADDRESS' screen. Enter an address of zero to terminate the program.

Should the checksum check fail, EDIT mode is entered, allowing you to use the left and right arrow keys to position the editor's up arrow marker below any offending characters and to overtype them with correct values. ‹S› instantly positions you at the checksum value should that be where the error lies. When editing is complete, press ‹ENTER› for the line to again be rechecked, and so on.

At any time that you wish to cease program data entry, mark listing 2 to indicate the restart point. Save the code **(CSAVEM"DIS1etc",12001,15210,12001).**

Strictly speaking, you only need to save the data entered so far, but to always use the final CSAVEM command avoids unwitting errors. When you wish to continue program data entry, CLOADM the last saved disassembler program data file, CLOAD the BASIC hex loader program, RUN and input the marked restart point as the start address.

Once the program data is fully entered, as a further precaution, check the overall checksum by exiting from the hex loader and type in RUN42‹enter›. This will tot up the values in locations 12001-15210 inclusive and display the total (it takes about 20 seconds). The overall checksum is 226149. If it does not agree, RUN47 will proceed to tot up and display each line's checksum total. In this phase, once you spot a discrepancy, ‹R› will re-RUN the hex loader program (press any other key to continue the tot up process). ▶

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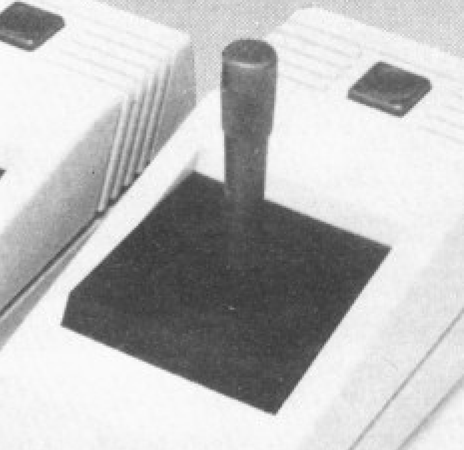
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◀ Once a clean bill of health is confirmed, save the program, **CSAVEM"DISASS"12001,15210,12001.**

Adjust the hex loader CLEAR (Line 3) and checking routines addresses (Lines 42, 47) if you wish to set up the program data at a lower address (you can always adjust its final loading position by CLOADM with offset and CSAVEM from that point once input). HEXLOADR may be of use for other similarly set up hex dumps — but they may not be 10 bytes per checksum. Adjust B=10 (Line 3) as appropriate — the program will cope with a maximum of 13 bytes per line without needing further amendment. Should the checksum value be given in hex (this dump has a decimal value), it can be entered using the standard BASIC facility (as can starting addresses presented in hex) of prefixing it with &H.

Using the disassembler

Now the BIG test: try it out on itself! EXEC12001.

The 'DISASSEMBLE FROM' address should be entered, as the $ prompt suggests, in hex (no &H prefix required). ‹Q› quits the program. Start with address $2F08. It should present you with a screen commencing:

addr.	obj. code	source	code
$2F08	8E0400	LDX	#$0400
$2F0B	9F88	STX	$ (dp) 88
$2F0D	CC6060	LDD	#$6060
$2F10	ED81	STD	,X++
$2F12	8C0600	CMPX	#$0600
$2F15	26F9	BNE	LABEL $2F10
$2F17	39	RTS	
$2F18	CC0000	LDD	#$0000
$2F1B	ED8C67	STD	LABEL,PCR $2F85

As you may recognise, this is a 'clear text screen to spaces' routine. You can now see why I described a disassembly as an assembly source "look-a-like" listing — gone are the helpful label names of a source listing; we are left with numbers alone.

Paging facilities

Once a screen, or page, of disassembly is displayed, it remains on the screen pending keyboard input.

‹Q› brings up the 'DISASSEMBLE FROM $' prompt allowing a new address to be entered

Listing 2
DISASSEMBLER HEX DUMP

```
12001 34 7F 8D 23 6F 8D 00 A0 30 8C  955
12011 09 A6 80 27 28 BD 80 0C 20 F7  990
12021 44 49 53 41 53 53 45 4D 42 4C  743
12031 45 20 46 52 4F 4D 20 24 00 8E  619
12041 04 00 9F 88 CC 60 60 ED 81 8C 1201
12051 06 00 26 F9 39 CC 00 00 ED 8C  931
12061 67 ED 8C 60 ED 8C 59 ED 8C 5C 1511
12071 BD 80 06 27 FB 81 51 26 02 35  916
12081 FF 81 0D 10 27 00 99 1F 89 C1  966
12091 30 25 E9 C0 30 C1 0A 25 0A C0 1000
12101 07 C1 0A 25 DD C1 0F 22 D9 BD 1116
12111 80 0C 34 04 A6 8C 2F C6 10 3D  824
12121 1E 89 34 06 A6 8C 26 C6 10 3D  844
12131 E3 E1 EB E0 ED 8C 1B ED 8C 16 1714
12141 ED 8C 11 ED 8C 0A DC 88 C4 16 1355
12151 C1 16 27 56 20 AA 00 01 02 03  548
12161 04 05 06 07 08 09 0A 0B 0C 10   88
12171 AF 8C F7 6D 8C F8 27 08 86 5D 1333
12181 BD 80 0C 6F 8C EE 86 0D BD 80 1282
12191 0C 9E 88 8C 05 C0 25 35 BD 80 1050
12201 06 27 FB 81 51 10 27 FF 37 81 1000
12211 5E 26 05 EC 8C CA 20 13 81 4B  970
12221 26 08 EC 8C BF ED 8C B8 20 0A 1216
12231 81 08 26 06 EC 8C AF ED 8C B4 1289
12241 17 FF 34 EC 8C AE ED 8C A7 9E 1582
12251 88 AF 8C A0 EC 8C A3 17 03 AB 1347
12261 EC 8C 97 C3 00 06 DD 88 10 AE 1275
12271 8C 94 A6 A0 34 02 17 03 7A DC 1036
12281 88 ED 8C 8A 35 02 81 10 26 06  895
12291 33 8D 04 49 20 08 81 11 26 70  605
12301 33 8D 04 C9 1F 89 A6 A0 34 06  949
12311 17 03 58 35 06 30 8C 50 34 10  509
12321 30 8C 42 34 10 A1 80 27 31 AC  871
12331 62 26 F8 C1 11 10 27 00 95 81  927
12341 21 10 25 00 8F 81 2F 22 0B 32  500
12351 64 33 8D 04 CC 84 0F 4A 20 38  809
12361 30 8C 31 AF 62 30 8C 1E A1 80 1017
12371 27 06 AC 62 26 F8 20 6E 1F 10  790
12381 A3 E1 5A 1F 98 32 62 20 1B 3F  931
12391 83 8C 93 9C A3 AC B3 BC 8E 9E 1576
12401 9F AE AF BE BF CE DE DF EE EF 2017
12411 FE FF 33 8D 04 E9 C6 06 3D 33 1254
12421 CB A6 C4 81 2D 27 43 DC 88 ED 1438
12431 8D 02 05 EC 8D FE E9 C3 00 11 1224
12441 DD 88 C6 05 1F 31 A6 80 BD 80 1251
12451 0C 5A 26 F8 A6 45 48 30 8C 04  887
12461 EC 86 6E 8B FE D9 00 52 00 98 1324
12471 00 A7 01 0D 00 CC 01 6F 00 00  497
12481 00 00 00 77 00 A1 00 B2 32 64  608
12491 20 02 32 61 EC 8D FE B4 DD 88 1349
12501 86 0D BD 80 0C AE 8D FE A1 30 1254
12511 88 17 10 AE 8D FE 9F A6 A0 81 1358
12521 20 25 0C 81 7F 22 08 9F 88 BD  863
12531 80 0C 16 FE 92 86 20 A7 84 30 1075
12541 01 9F 88 16 FE 87 17 02 B4 17  935
12551 02 95 17 02 5A 86 28 BD 80 0C  769
12561 86 64 BD 80 0C 86 70 BD 80 0C 1138
12571 86 29 BD 80 0C A6 A0 17 02 4D  932
12581 16 FE 62 17 02 95 17 02 70 EC  921
12591 A1 17 02 5D EC 8D FE 48 C3 00 1177
12601 1D DD 88 86 65 BD 80 0C 86 61 1181
12611 BD 80 0C 16 FE 41 17 02 6E 17  828
12621 02 79 16 FE 38 17 02 7E 16 FE  882
12631 32 17 02 5F 17 02 7D E6 A0 1D  739
12641 20 08 17 02 5A 17 02 72 EC A1  691
12651 17 02 8E 16 FE 19 44 58 59 55  798
12661 53 50 2D 2D 41 42 43 44 17 02  544
12671 3A 17 02 1B E6 A0 34 04 54 54  724
12681 54 54 8D 17 30 8C E1 17 02 84  902
12691 17 01 CC E6 E4 C4 0F 8D 08 17 1069
12701 02 78 32 61 16 FD E6 C1 06 25 1010
12711 08 C1 08 25 05 C1 0B 22 01 39  547
12721 32 63 16 FF 19 43 41 42 44 58  805
12731 59 2D 50 17 01 F9 C6 20 34 04  773
12741 E6 A0 34 04 C6 01 34 04 EC 8D 1078
12751 FD AE C3 00 17 83 00 01 DD 88 1134
12761 30 8C DA E6 61 E4 E4 27 33 A6 1445
12771 62 BD 80 0C 86 2C A7 62 A6 84 1168
12781 81 2D 26 0C A6 3E 81 36 25 04  676
12791 86 53 20 02 86 55 BD 80 0C C1  992
12801 01 27 0C C1 08 26 04 86 50 20  541
12811 06 C1 80 26 05 86 43 BD 80 0C  900
12821 30 01 68 E4 26 C1 32 63 16 FD 1036
12831 6A 17 01 97 A6 A0 34 02 81 7F  917
12841 22 37 17 01 70 A6 E4 84 1F 85  915
12851 10 27 0D 17 01 31 A6 E4 84 0F  682
12861 34 02 86 10 A0 E0 81 0A 25 0B  775
12871 34 02 86 31 BD 80 0C 35 02 80  749
12881 0A 8B 30 BD 80 0C 17 01 08 35  611
12891 02 17 01 D1 16 FD 28 6F 8C 34  853
12901 6F 8C 2D 6F 8C 2B 84 0F 48 30  857
12911 8C 04 EC 86 6E 8B 00 25 00 54  884
12921 00 25 00 54 00 54 00 2E 00 32  301
12931 FE 58 00 36 00 3B FE 58 00 40  961
12941 00 36 00 3B FE 58 00 44 0D 0E  550
12951 0F 10 11 A6 E4 85 10 27 33 16  703
12961 FE 2A 86 42 20 1F 86 41 20 1B  817
12971 6C 8C E7 20 19 6C 8C E3 20 14 1063
12981 86 44 20 0D A6 E4 85 10 10 27  845
12991 FE 0C 6C 8C D2 20 09 A7 8C D0 1280
13001 A6 E4 85 10 27 04 6C 8D FC B6 1269
13011 6D 8C BF 27 11 17 00 E1 A6 E4 1138
13021 85 04 27 24 17 00 FB 35 02 16  563
13031 FE 75 6D 8C AA 27 38 17 00 D1 1117
13041 A6 E4 84 0F 81 0F 27 0C 85 04  873
13051 27 08 17 00 DF 35 02 16 FE 64  724
13061 17 00 96 6D 8C 8A 27 07 A6 A0  932
13071 17 00 78 20 22 EC A1 17 00 77  748
13081 A6 E4 84 0F 81 0F 26 15 32 61  891
13091 16 FE 0D 17 00 75 6D 8D FF 6C 1042
13101 27 07 A6 8D FF 66 BD 80 0C 8D 1180
13111 2A A6 E4 84 0F 81 03 26 04 8D  898
13121 28 20 04 81 02 26 02 8D 20 A6  586
13131 E4 17 00 E1 A6 E4 84 0F 81 01 1147
13141 22 06 25 02 8D 13 8D 11 32 61  544
13151 16 FC 28 86 2C 20 20 86 24 20  758
13161 1C 86 2D 20 18 86 2B 20 14 1F  523
13171 89 44 44 44 44 8D 04 1F 98 84  869
13181 0F 8B 30 81 3A 25 02 8B 07 BD  763
13191 80 0C 39 34 02 8D D8 20 0A 34  702
13201 04 34 02 8D D0 35 02 8D D8 35  872
13211 02 20 D4 EC 8D FB DD C3 00 17 1313
13221 DD 88 6D 8D FB DE 27 05 86 5B 1349
13231 BD 80 0C 39 EC 8D FE E0 DD 88 1598
13241 39 8D F7 A6 A4 20 B2 8D F1 EC 1603
13251 A4 34 04 20 D0 8D D4 86 23 BD 1171
13261 80 0C A6 A0 20 B7 8D EB 8D F1 1439
13271 A6 A0 20 97 86 05 20 02 86 09  825
13281 34 02 8D B9 30 8C 0B A6 80 BD 1062
13291 80 0C 6A E4 26 F7 35 82 4C 41 1083
13301 42 45 4C 2C 50 43 52 34 20 31  617
13311 AB 34 20 8D 9A EC 8D FB 77 C3 1492
13321 00 20 C3 00 17 DD 88 35 06 17  689
13331 FF 7B 35 A0 A6 85 BD 80 0C C1 1412
13341 0A 27 0A 25 04 86 50 20 06 C1  545
13351 05 26 05 86 43 BD 80 0C 39 84  767
13361 60 26 04 86 58 20 12 81 60 26  673
13371 04 86 53 20 0A 85 20 26 04 86  604
```

‹up arrow› returns you to the page starting from the last time an address was entered

‹K› sets a 'Key marker' so that . . .

‹left arrow› returns you to the page starting from the last time ‹K› was pressed

any other (including the response to ‹K›) displays the next page of disassembly.

Unless you need it specifically to mark an intermediate place, by using ‹K› when speedily paging forward, the previous page can be recalled when you realise that you have just passed the page you wanted to study!

The disassembler display

The disassembly listing above demonstrates three of the special considerations for newer machine coders.

Direct address (direct page) mode (Line $2F0B)

One of the easiest slips to make when coding or entering Assembler source is to omit the # sign when loading fixed values into registers. If the # is omitted, the instruction is assembled as a DIRECTLY ADDRESSED instruction instead of the intended IMMEDIATE MODE type, meaning that (Line $2F18) **LDD #$0000** (load a *value* of zero into Register D) becomes **LDD $0000** (load the *contents* of *memory location* zero into Register D).

Some assemblers allow it to be overridden (when is life ever easy?) but generally, when the operand value is ‹256, it is actually tagged on to the DIRECT PAGE REGISTER (abbreviated to DP or DPR) to form a 16-bit address, for example:

DP contains 0 operand and value 5 = memory address $0005

DP contains 6 operand value 5 = memory address $0605

If never touched by programs, the DP register remains at zero.

You can quite happily machine code for ever without using such powerful options as the direct page facility. However, when you use something in BASIC's workspace, such as the text screen pointer at location $88, you use it without realising it. To attract your attention to potential program errors (accidentally omitted #'s) and the true constitution of the address in DIRECT ADDRESSING mode, the disassembler display precedes the operand value with the letters 'DP' in inverted screen within round brackets.

Relative branch instructions (Line $2F15). The operand of branch instructions may take a number of different forms. The most usual form is simply a label name. The disassembler display tells you this by displaying the word **LABEL** then below it gives the address of the instruction branched to.

Program counter relative addressing (PCR) (Line $2F1B). As with the RELATIVE BRANCH instructions, the disassembler display for such instructions is as you would actually write the source code, **LABEL,PCR.** The address of the location referred to is displayed on the line below.

Other display considerations are:

Extended addressing. The DIRECT ADDRESSING item above mentioned the accidental omission of # signs from IMMEDIATE MODE instructions turning them into DIRECTLY ADDRESSED mode. As an aid to programmers, this disassembler appends **EA** in inverted screen to extended addressing operands to quickly alert you to cases of inadvertently omitted # signs on double byte operands. (Example: $2F27, a JSR to an extended address location.)

Indirect addressing. Another area where you can quite happily machine code for ever without using such an option . . . The operands of such instructions (including calculated addresses for ',PCR' instructions) are enclosed within Motorola's square bracket notation. (Example: $306C — some preset data — disassembles as an INDIRECT ADDRESS mode instruction.)

Constant offset instructions. Those with offsets 0 to +15/−16 are displayed in decimal (example $2EE8); offsets outside this range are less common and are displayed as hex values, preceded by a $ to remind you of this. The offset is a *signed* value (so is negative if the most significant bit is set). We need BASIC ROM for an

13381	55	20	02	86	59	BD	80	0C	39	00	728
13391	00	53	57	49	32	20	00	43	4D	50	549
13401	44	20	0A	43	4D	50	59	20	0A	43	532
13411	4D	50	44	20	01	43	4D	50	59	20	603
13421	01	43	4D	50	44	20	06	43	4D	50	555
13431	59	20	06	43	4D	50	44	20	09	43	527
13441	4D	50	59	20	09	4C	44	59	20	20	584
13451	0A	4C	44	59	20	20	01	53	54	59	564
13461	20	20	01	4C	44	59	20	20	06	53	451
13471	54	59	20	20	06	4C	44	59	20	20	540
13481	09	53	54	59	20	20	09	4C	44	53	565
13491	20	20	0A	4C	44	53	20	20	01	53	449
13501	54	53	20	20	01	4C	44	53	20	20	523
13511	06	53	54	53	20	20	06	4C	44	53	553
13521	20	20	09	53	54	53	20	20	09	53	479
13531	57	49	33	20	00	43	4D	50	55	20	584
13541	0A	43	4D	50	53	20	0A	43	4D	50	583
13551	55	20	01	43	4D	50	53	20	01	43	525
13561	4D	50	55	20	06	43	4D	50	53	20	619
13571	06	43	4D	50	55	20	09	43	4D	50	580
13581	53	20	09	4C	42	52	4E	20	0B	4C	545
13591	42	48	49	20	0B	4C	42	4C	53	20	587
13601	0B	4C	42	43	43	20	0B	4C	42	43	539
13611	53	20	0B	4C	42	4E	45	20	0B	4C	534
13621	42	45	51	20	0B	4C	42	56	43	20	586
13631	0B	4C	42	56	53	20	0B	4C	42	50	587
13641	4C	20	0B	4C	42	4D	49	20	0B	4C	530
13651	42	47	45	20	0B	4C	42	4C	54	20	583
13661	0B	4C	42	47	54	20	0B	4C	42	4C	569
13671	45	20	0B	4E	45	47	20	20	01	2D	440
13681	2D	2D	2D	2D	01	2D	2D	2D	2D	2D	406
13691	01	43	4F	4D	20	20	01	4C	53	52	530

13701	20	20	01	2D	2D	2D	2D	2D	01	52	373
13711	4F	52	20	20	01	41	53	52	20	20	520
13721	01	41	53	4C	20	20	01	52	4F	4C	527
13731	20	20	01	44	45	43	20	20	01	2D	379
13741	2D	2D	2D	2D	01	49	4E	43	20	20	463
13751	01	54	53	54	20	20	01	4A	4D	50	548
13761	20	20	01	43	4C	52	20	20	01	2D	400
13771	2D	2D	2D	2D	2D	2D	2D	2D	2D	2D	450
13781	2D	4E	4F	50	20	20	00	53	59	4E	596
13791	43	20	00	2D	2D	2D	2D	2D	00	2D	369
13801	2D	2D	2D	2D	00	4C	42	52	41	20	501
13811	0B	4C	42	53	52	20	0B	2D	2D	2D	496
13821	2D	2D	00	44	41	41	20	20	00	4F	431
13831	52	43	43	20	02	2D	2D	2D	2D	2D	475
13841	02	41	4E	44	43	43	02	53	45	58	589
13851	20	20	00	45	58	47	20	20	05	54	445
13861	46	52	20	20	05	42	52	41	20	20	498
13871	03	42	52	4E	20	20	03	42	48	49	507
13881	20	20	03	42	4C	53	20	20	03	42	425
13891	43	43	20	20	03	42	43	53	20	20	481
13901	03	42	4E	45	20	20	03	42	45	51	499
13911	20	20	03	42	56	43	20	20	03	42	419
13921	56	53	20	20	03	42	50	4C	20	20	522
13931	03	42	4D	49	20	20	03	42	47	45	492
13941	20	20	03	42	4C	54	20	20	03	42	426
13951	47	54	20	20	03	42	4C	45	20	20	497
13961	03	4C	45	41	58	20	06	4C	45	41	549
13971	59	20	06	4C	45	41	53	20	06	4C	534
13981	45	41	55	20	06	50	53	48	53	20	607
13991	04	50	55	4C	53	20	04	50	53	48	599
14001	55	20	04	50	55	4C	55	20	04	2D	528
14011	2D	2D	2D	2D	00	52	54	53	20	20	493

14021	00	41	42	58	20	20	00	52	54	49	522
14031	20	20	00	43	57	41	49	20	02	4D	467
14041	55	4C	20	20	00	2D	2D	2D	2D	2D	450
14051	00	53	57	49	20	20	00	4E	45	47	525
14061	41	20	00	2D	2D	2D	2D	2D	00	2D	367
14071	2D	2D	2D	2D	00	43	4F	4D	41	20	500
14081	00	4C	53	52	41	20	00	2D	2D	2D	473
14091	2D	2D	00	52	4F	52	41	20	00	41	495
14101	53	52	41	20	00	41	53	4C	41	20	583
14111	00	52	4F	4C	41	20	00	44	45	43	538
14121	41	20	00	2D	2D	2D	2D	2D	00	49	395
14131	4E	43	41	20	00	54	53	54	41	20	590
14141	00	2D	2D	2D	2D	2D	00	43	4C	52	450
14151	41	20	00	4E	45	47	42	20	00	2D	458
14161	2D	2D	2D	2D	00	2D	2D	2D	2D	2D	405
14171	00	43	4F	4D	42	20	00	4C	53	52	562
14181	42	20	00	2D	2D	2D	2D	2D	00	52	405
14191	4F	52	42	20	00	41	53	52	42	20	587
14201	00	41	53	4C	42	20	00	52	4F	4C	559
14211	42	20	00	44	45	43	42	20	00	2D	445
14221	2D	2D	2D	2D	00	49	4E	43	42	20	496
14231	00	54	53	54	42	20	00	2D	2D	2D	484
14241	2D	2D	00	43	4C	52	42	20	00	4E	491
14251	45	47	20	20	06	2D	2D	2D	2D	2D	435
14261	06	2D	2D	2D	2D	2D	06	43	4F	4D	460
14271	20	20	06	4C	53	52	20	20	06	2D	426
14281	2D	2D	2D	2D	06	52	4F	52	20	20	493
14291	06	41	53	52	20	20	06	41	53	4C	530
14301	20	20	06	52	4F	4C	20	20	06	44	445
14311	45	43	20	20	06	2D	2D	2D	2D	2D	431
14321	06	49	4E	43	20	20	06	54	53	54	545
14331	20	20	06	4A	4D	50	20	20	06	43	438

example of this — try $8865 $12,S = 18,S in decimal.

Invalid codes. Variable storage (RMB) and presents (FCB/FCC/FDB) can occur anywhere amongst the code (as long as you don't try to obey it as it is quite a different kettle of fish to BASIC that kindly dodges round DIM/DATA statements interspersed with instructions), so the disassembler may well come across 'invalid' instruction codes. In such instances, the 'offending' byte of 'object code' is displayed as normal and the character equivalent (or black blob if it is an unprintable character) is displayed in the operand column. (Examples: $2EF8 shows a printable, invalid code; $3073 for an unprintable character.)

Miscellaneous points

When you disassemble, you will find odd variations may occur. For example, to assist in logical coding and understanding, most Assemblers allow you to **PSH/PUL** Register D as its double byte unit. As far as the machine is concerned in a PSH/PUL, Register D is always treated as the individual Registers A and B, which is what an Assembler translates a PSH/PUL D as. A disassembler is unaware of the logic of the program at the point of the PSH/PUL so invariably, this one being no different, disassembles as if they were the individual registers A and B.

A **zero offset** instruction, such as **LDA 0,X** would, according to published Motorola data sheets, be expected to have object code $A600. In practice, many Assemblers generate the alternative 'comma register' form for zero offsets. DREAM is no exception, generating object code $A684. Thus the disassembly will show **$addr A684 LDA ,X.**

Motorola, possibly for technical reasons but it does offer clearer program logic, also recommend that in a few cases, two different mnemonics be provided that in fact generate identical machine code instructions. This disassembler prints the alphabetically lower mnemonic of the two, so may occasionally look slightly at variance with a published source code listing. The pairings are:

Object code		Mnemonic
08		ASL/LSL
1024		LBCC/LBHS
1025		LBCS/LBLO
24		BCC/BHS
25		BCS/BLO
48		ASLA/LSLA
58		ASLB/LSLB
68/78		ASL/LSL

The machine code sleuth

It is extremely difficult to hide machine code.

Articles usually tell you the EXEC address, so start from there.

Disassemble the disassembler from the beginning. It will display:

```
$2EE1 347F       PSHS  CC,A,B,DP,X,Y,U
$2EE3 8D23       BSR   LABEL
                       $2F08
$2EE5 6F8D00A0   CLR   LABEL,PCR
                       $2F89
$2EE9 308C09     LEAX  LABEL,PCR
                       $2EF5
$2EEC A680       LDA   ,X+
$2EEE 2728       BEQ   LABEL
                       $2F18
$2EF0 BD800C     JSR   $800C ea
$2EF3 20F7       BRA   LABEL
                       $2EEC
(page forward)
$2EF5 44         LSRA
$2EF6 49         ROLA
$2EF7 53         COMB
$2EF8 41               A
```

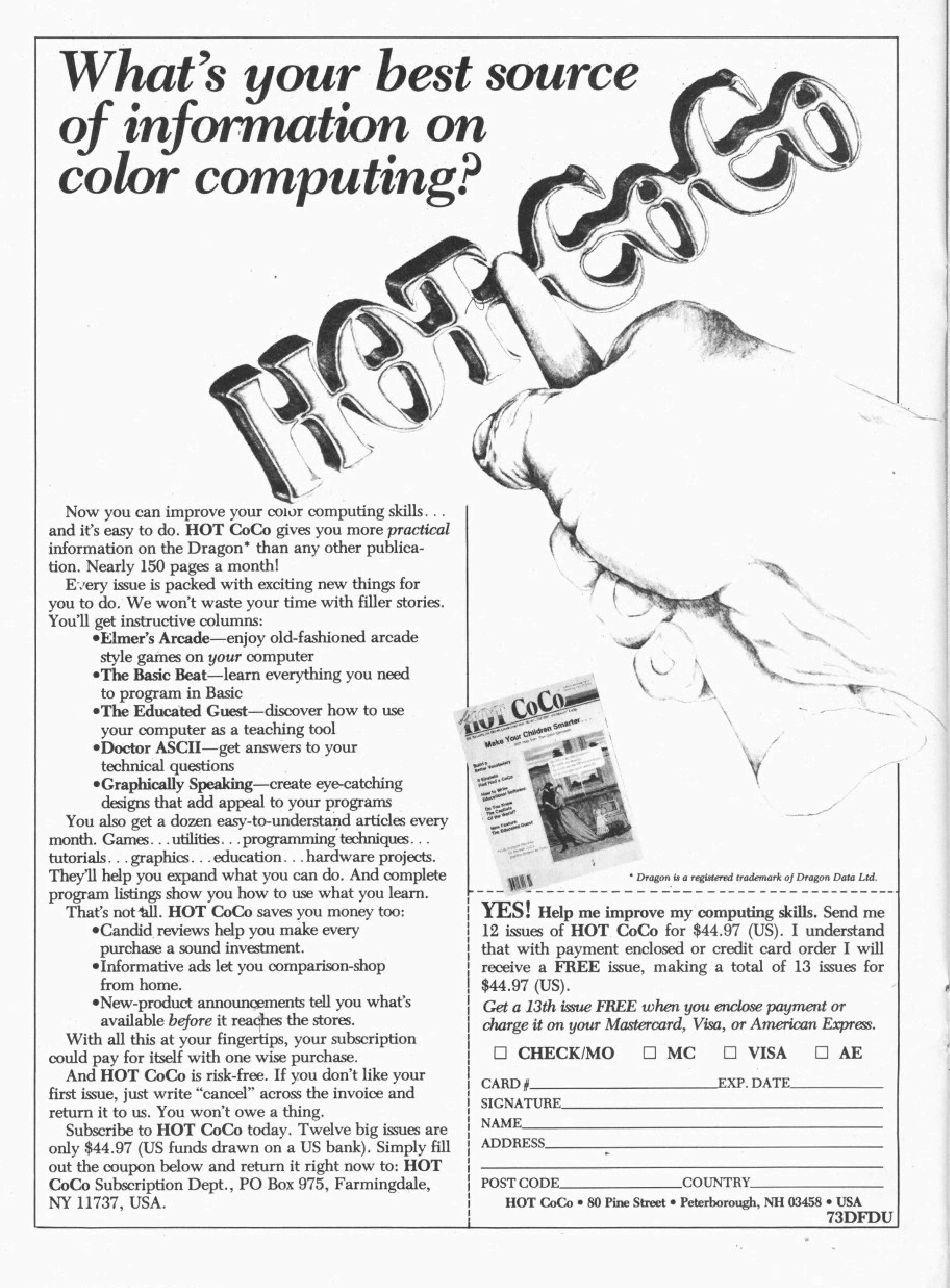
Invalid or unlikely looking program instructions (for example, lots of COMs/NEGs/EORs) give you the clue that an area of 'program' is in fact a variables/preset data area. $2EF5 is in fact the 'DISASSEMBLE FROM $' program presets start address (as loaded into Register X at $2EE9). However, further program instruction addresses have been revealed — $2EEE BEQ to the label at address $2F18. ‹Q› and disassembly from $2F18 reveals more code etc. This way, you can track down the program code despite it being interspersed with non-program code areas. To disassemble (and security copy) auto-run programs, CLOADM with an offset to load at graphics page 1 or higher in memory and tackle them from there.

Too much of a challenge?

Should entering the program data seem too daunting rather than a challenge, as with previous articles, for instant usage, I shall happily supply the programs on cassette for £3.00 including p&p (21 Wycombe Lane, Wooburn Green, High Wycombe, Bucks HP10 0HD).

```
14341 4C 52 20 20 06 4E 45 47 20 20  510
14351 09 2D 2D 2D 2D 2D 09 2D 2D 2D  378
14361 2D 2D 09 43 4F 4D 20 20 09 4C  471
14371 53 52 20 20 09 2D 2D 2D 2D 2D  463
14381 09 52 4F 52 20 20 09 41 53 52  555
14391 20 20 09 41 53 4C 20 20 09 52  452
14401 4F 4C 20 20 09 44 45 43 20 20  496
14411 09 2D 2D 2D 2D 2D 09 49 4E 43  461
14421 20 20 09 54 53 54 20 20 09 4A  471
14431 4D 50 20 20 09 43 4C 52 20 20  519
14441 09 53 55 42 41 20 02 43 4D 50  566
14451 41 20 02 53 42 43 41 20 02 53  497
14461 55 42 44 20 0A 41 4E 44 41 20  569
14471 02 42 49 54 41 20 02 4C 44 41  533
14481 20 20 02 2D 2D 2D 2D 2D 02 45  362
14491 4F 52 41 20 02 41 44 43 41 20  557
14501 02 4F 52 41 20 20 02 41 44 44  495
14511 41 20 02 43 4D 50 58 20 0A 42  519
14521 53 52 20 20 03 4C 44 58 20 20  528
14531 0A 2D 2D 2D 2D 2D 2D 4C 44 58  512
14541 20 20 01 43 4D 50 41 20 01 53  470
14551 42 43 41 20 01 53 55 42 44 20  565
14561 01 41 4E 44 41 20 01 42 49 54  533
14571 41 20 01 4C 44 41 20 20 01 53  455
14581 54 41 20 20 01 45 4F 52 41 20  541
14591 01 41 44 43 41 20 01 4F 52 41  525
14601 20 20 01 41 44 44 41 20 01 43  431
14611 4D 50 58 20 01 4A 53 52 20 20  581
14621 01 4C 44 58 20 20 01 53 54 58  553
14631 20 20 01 53 55 42 41 20 06 43  469
14641 4D 50 41 20 06 53 42 43 41 20  573
14651 06 53 55 42 44 20 06 41 4E 44  557
14661 41 20 06 42 49 54 41 20 06 4C  505
14671 44 41 20 20 06 53 54 41 20 20  499
14681 06 45 4F 52 41 20 06 41 44 43  539
14691 41 20 06 4F 52 41 20 20 06 41  464
14701 44 44 41 20 06 43 4D 50 58 20  583
14711 06 4A 53 52 20 20 06 4C 44 58  547
14721 20 20 06 53 54 58 20 20 06 53  478
14731 55 42 41 20 09 43 4D 50 41 20  578
14741 09 53 42 43 41 20 09 53 55 42  565
14751 44 20 09 41 4E 44 41 20 09 42  492
14761 49 54 41 20 09 4C 44 41 20 20  536
14771 09 53 54 41 20 20 09 45 4F 52  544
14781 41 20 09 41 44 43 41 20 09 4F  491
14791 52 41 20 20 09 41 44 44 41 20  518
14801 09 43 4D 50 58 20 09 4A 53 52  601
14811 20 20 09 4C 44 58 20 20 09 53  461
14821 54 58 20 20 09 53 55 42 42 20  577
14831 02 43 4D 50 42 20 02 53 42 43  542
14841 42 20 02 41 44 44 44 20 0A 41  476
14851 4E 44 42 20 02 42 49 54 42 20  567
14861 02 4C 44 42 20 20 02 2D 2D 2D  413
14871 2D 2D 02 45 4F 52 42 20 02 41  487
14881 44 43 42 20 02 4F 52 42 20 20  526
14891 02 41 44 44 42 20 02 4C 44 44  515
14901 20 20 0A 2D 2D 2D 2D 2D 0A 4C  385
14911 44 55 20 20 0A 2D 2D 2D 2D 2D  452
14921 2D 53 55 42 42 20 01 43 4D 50  602
14931 42 20 01 53 42 43 42 20 01 41  479
14941 44 44 44 20 01 41 4E 44 42 20  546
14951 01 42 49 54 42 20 01 4C 44 42  533
14961 20 20 01 53 54 42 20 20 01 45  432
14971 4F 52 42 20 01 41 44 43 42 20  558
14981 01 4F 52 42 20 20 01 41 44 44  494
14991 42 20 01 4C 44 44 20 20 01 53  459
15001 54 44 20 20 01 4C 44 55 20 20  510
15011 01 53 54 55 20 20 01 53 55 42  552
15021 42 20 06 43 4D 50 42 20 06 53  515
15031 42 43 42 20 06 41 44 44 44 20  538
15041 06 41 4E 44 42 20 06 42 49 54  544
15051 42 20 06 4C 44 42 20 20 06 53  467
15061 54 42 20 20 06 45 4F 52 42 20  548
15071 06 41 44 43 42 20 06 4F 52 42  537
15081 20 20 06 41 44 44 42 20 06 4C  451
15091 44 44 20 20 06 53 54 44 20 20  505
15101 06 4C 44 55 20 20 06 53 54 55  557
15111 20 20 06 53 55 42 42 20 09 43  478
15121 4D 50 42 20 09 53 42 43 42 20  578
15131 09 41 44 44 44 20 09 41 4E 44  530
15141 42 20 09 42 49 54 42 20 09 4C  513
15151 44 42 20 20 09 53 54 42 20 20  504
15161 09 45 4F 52 42 20 09 41 44 43  546
15171 42 20 09 4F 52 42 20 20 09 41  472
15181 44 44 42 20 09 4C 44 44 20 20  519
15191 09 53 54 44 20 20 09 4C 44 55  546
15201 20 20 09 53 54 55 20 20 09 FF  653

OVERALL CHECKSUM TOTAL 226149
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Loony lunar lunchtime

*This month's star game is Moon Miner from **Steve Gathercole** — so get your jet pack on, lunch break is about to start*

THIS MONTH'S Star Game is a race against time. You are a hard-working miner, digging dusty diamonds deep beneath the lunar surface. As lunch-time approaches, you realise to your horror that you have left your lunchbox at the top of the mine — even worse, you have forgotten all your workmates' lunches as well and they are getting hungry.

You only have a short lunch break, so you must use your jetpack to manouevre your way to the top, and collect all the lunches, then jump down the lift shaft. lunches, then jump down the lift shaft back to the bottom.

Unfortunately each of the levels are connected by openings which keep on moving due to seismic activity deep within the Moon. You must be careful jumping through the openings, otherwise you will lose points by banging your head.

Full instructions for playing the game are included in the listing. Good luck!

Program notes

Arrays:

SL — Jet man flying left
SR — Jet man flying right
NO — Number 10
CB — Lunch box
BL — Blank

Variables:

SC — Score
HC — High score
DX — X position of jet man
DY — Y position of jet man
BX — No of lunch boxes
LD — Position for lunch boxes
A$ — Draw string for letters and numbers on high res screen
Z$, B$, C$, D$, E$, F$, A1, A2, A3, A4, A5, A6 Are all string and score variables used in the hall of fame

Program structure:

Lines 40- 170 Read and Poke machine code data and error check
Lines 170- 440 Instructions
Lines 440- 540 Initialisation
Lines 540- 620 More instructions
Lines 620- 930 Set up and draw screen
Lines 930-1030 Main loop

Subroutines

1040 — Decrease score if bump head
1070 — Time up (lunch break over)
1210 — Bonus routine
1390 — Go again routine
1450 — Pick up lunch box
1510 — Come down lift routine
1610 — Move right
1800 — Move left
1860 — Move up and left
2100 — Graphics poke routine
2310 — Draw string routine and data
2410 — Actual draw routine.

Machine code routines

EXEC 30000 Screen invert
EXEC 30100 Noise
EXEC 30150 Scroll screen clear
EXEC 30015 Platform scroll routines

```
10 REM****MINER***********
20 REM**STEVE GATHERCOLE**
30 REM***1985********
40 PCLEAR 8
50 CLEAR 200,29999:A=30000:S=0
60 REM**READ M/C DATA
70 FOR N=0 TO 177:READ H$:POKE A+N
,VAL("&H"+H$)
80 S=S+VAL("&H"+H$)
90 NEXT N
100 IF S<>18777  THENCLS:PRINT" M/
C DATA ERROR":SOUND 250,6:END
110 DATA 8E,04,00,A6,84,88,40,A7,8
0,8C,06,00,25,F5,39
120 DATA 8E,0C,E0,E6,80,34,04,C6,1
D,A6,80,A7,1E,5A,26,F9,35,04,E7,1F
,10,AE,81,8C,0D,80,25,E7
130 DATA 8E,13,1E,E6,82,34,04,C6,1
D,A6,82,A7,01,5A,26,F9,35,04,E7,84
,10,AE,83,8C,12,80,2E,E7
140 DATA 8E,18,00,E6,80,34,04,C6,1
D,A6,80,A7,1E,5A,26,F9,35,04,E7,1F
,10,AE,81,8C,18,81,25,E7,39
150 DATA 34,32,B6,FF,23,8A,08,B7,F
F,23,8E,00,01,86,FF,B7,FF,20,8D,17
,7F,FF,20,8D,12,30,01,8C,00,A7,25,
ED,B6,FF,23,84,F7,B7,FF,23,35,32,3
9,1F,12,31,3F,26,FC,39
160 DATA 8E,04,00,E6,80,34,04,C6,1
F,A6,80,A7,1E,5A,26,F9,35,04,C6,A9
,E7,1F,8C,06,00,25,E8,39
170 CLS:PRINT@10,"MOON   MINER"
180 PRINT@40,STRING$(16,"*")
190 PRINT:PRINT"YOU ARE A MINER IN
 THE MINE"
200 PRINT"WORKINGS DEEP DOWN IN TH
E MOON,"
210 PRINT:PRINT"IT IS NEARLY DINNE
R TIME AND "
220 PRINT"YOU HAVE LEFT BOTH YOUR
OWN AND"
230 PRINT"YOUR WORKMATES LUNCH BOX
```

```
ES UP "
240 PRINT"ON THE FIRST LEVEL!!"
250 PRINT:PRINT"YOU MUST GET TO TH
E TOP OF THE"
260 PRINT"WORKINGS AS QUICK AS POS
SIBLE"
270 PRINT"USING YOUR JET PACK"
280 EXEC 30000
290 PRINT@488,"PRESS ANY KEY";
300 A$=INKEY$:IF A$="" THEN 300
310 CLS:PRINT:PRINT"UNFORTUNATLY T
HE OPENINGS IN"
320 PRINT"EACH OF THE LEVELS KEEPS
 MOVING"
330 PRINT"AND YOUR DINNER BREAK DO
ES NOT"
340 PRINT"LAST VERY LONG!!"
350 PRINT:PRINT"USE THE RIGHT JOYS
TICK TO MOVE"
360 PRINT"LEFT,RIGHT, AND USE THE
FIRE"
370 PRINT"BUTTON TO JUMP THROUGH T
HE"
380 PRINT"SMALL OPENINGS YOU MUST
NOT "
390 PRINT"BUMP YOUR HEAD ,YOU LOSE
 POINTS"
400 PRINT:PRINT"ONCE YOU HAVE COLL
ECTED A BOX"
410 PRINT"QUICKLY RETURN DOWN THE
"
420 PRINT"LIFT SHAFT TO THE RIGHT
OF THE"
430 PRINT"MINE WORKINGS"
440 EXEC 30000
450 REM**INITIALISE
460 DIM SL(8),SR(8),NO(2),LB(2)
470 DIM BL(8),ML(2),NL(2)
480 DX=10:DY=165
490 J0=JOYSTK(0):J1=JOYSTK(1)
500 SC=0:DIM BB(12):BX=4
510 LD=181:SC=0:HI=0
520 GOTO 1970
530 PRINT@488,"PRESS ANY KEY";
540 A$=INKEY$:IF A$="" THEN 540
550 CLS:PRINT@10,"NEARLY READY"
560 PRINT@40,STRING$(16,"*")
570 PRINT:PRINT"IF YOU COLLECT ALL
 THE LUNCH"
580 PRINT"BOXES BEFORE THE LUNCH B
REAK"
590 PRINT"IS OVER YOU WILL RECIVE
A BONUS"
600 PRINT"DEPENDING ON HOW MUCH TI
ME IS"
610 PRINT"LEFT AND ADDED TO YOU SC
ORE"
620 PRINT:PRINT"GOOD LUCK....."
630 EXEC 30000
640 GOSUB 2320
650 PMODE 3,1:PCLS
660 REM**SET UP SCREEN
670 COLOR 4:LINE(0,0)-(254,14),PSE
T,BF
680 GET(60,1)-(90,16),BB,G
690 COLOR 3:LINE(0,55)-(62,59),PSE
T,BF
700 COLOR 3:LINE(80,55)-(238,59),P
SET,BF
710 COLOR 3:LINE(0,100)-(148,104),
PSET,BF
720 COLOR 3:LINE(166,100)-(238,104
),PSET,BF
730 COLOR 3:LINE(0,144)-(54,148),P
SET,BF:LINE(72,144)-(238,148),PSET
,BF
740 COLOR 3:LINE(0,188)-(254,190),
PSET,BF
750 COLOR 3:LINE(238,56)-(238,190)
,PSET
760 COLOR 3:LINE(0,0)-(254,190),PS
ET,B
770 S=4:R=33
780 FOR R=33 TO 48 STEP 5
790 PUT(S,R)-(S+13,R+5),LB,PSET
800 NEXT R
810 R=33
820 PUT(DX,DY)-(DX+13,DY+21),SR,PS
ET
830 PCOPY 1 TO 5:PCOPY 2 TO 6:PCOP
Y 3 TO 7:PCOPY 4 TO 8
840 PRINT@490,"PRESS ANY KEY";
850 A$=INKEY$:IF A$="" THEN 850
860 T$="STEVE":C$="DONALD":D$="MIC
KY":E$="WINNIE":F$="FROGLET":A1=0:
A2=92:A3=0:A4=0:A5=0:A6=0
870 XX=6:YY=3:A$="SCORE":DRAW"C2S8
":GOSUB 2410
880 XX=160:YY=3:A$="HIGH":DRAW"C2S
8":GOSUB 2410
890 XX=60:YY=3:A$=STR$(SC):DRAW"C2
S8":GOSUB 2410
900 XX=215:YY=3:A$=STR$(HI):DRAW"C
2S8":GOSUB 2410
910 SCREEN 1,0
920 PLAY"V21T2O3L8GL8BO4L8DL8DL8EL
8EL8DO3L8BL8GL8BO4L8DL8DL8CO3L8BL4
AL8GL8BO4L4DO3L8.GL16BL8AL8G L8FL8
D"
930 REM MAIN LOOP
940 TIMER=0
950 J0=JOYSTK(0)
960 EXEC 30015
970 TI=TIMER
980 IF J0>33 THEN GOSUB 1620
990 IF J0<31 THEN GOSUB 1810
1000 IF DY<58 AND DX<25 THEN GOSUB
 1460
1010 IF TI>=6900 THEN 1080
1020 IF LD=161 THEN GOSUB 1220
```

```
1030 GOTO 950
1040 IF SC<=0 THEN RETURN
1050 PUT(60,1)-(90,15),BB,PSET:SC=
SC-1:XX=60:YY=3:A$=STR$(SC):DRAW"C
2S8":GOSUB 2410
1060 RETURN
1070 REM**TIME UP
1080 XX=35>YY=68:A$="LUNCH BREAK O
VER":DRAW"C3S8":GOSUB 2410
1090 FOR Q=O TO 4:EXEC 30100:NEXT
Q
1100 FOR T=0 TO 500:NEXT T
1110 A1=SC:CLS RND(8):PRINT@39,"FI
NAL SCORE WAS";SC;
1120 IF A1>A6 THEN PRINT@96,"";:IN
PUT "YOUR NAME";Z$ ELSE 1150
1130 IF A1>A2 THEN A6=A5:A5=A4:A4=
A3:A3=A2:A2=A1:F$=E$:E$=D$:D$=C$:C
$=T$:T$=Z$:GOTO 1150 ELSE IF A1>A3
 THEN A6=A5:A5=A4:A4=A3:A3=A1:F$=E
$:E$=D$:D$=C$:C$=Z$:GOTO 1150 ELSE
 IF A1>A4 THEN A6=A5:A5=A4:A4=A1:F
$=E$:E$=D$:D$=Z$:GOTO 1150
1140 IF A1>A5 THEN A6=A5:A5=A1:F$=
E$:E$=Z$:GOTO 1150 ELSE A6=A1:F$=Z
$
1150 PRINT@170,A2"BY  " T$;:PRINT@
234,A3;"BY  "C$;:PRINT@298,A4;"BY
 ";D$;:PRINT@362,A5;"BY  ";E$;:PRI
NT@426,A6;"BY  ";F$;
1160 PLAY"O2T5V15CV10CV5CP100V15FV
10FV5FP200V15EV15EV5EP200V15GV10GV
5GV15FV10FV5FP200V15AV10AV5AO3P100
V15CV10CV5CV2C"
1170 PRINT@486,"ANOTHER GAME (Y/N)
 ?";
1180 A$=INKEY$:IF A$="Y" THEN FOR
W=1 TO 32:EXEC 30150:NEXT W:PMODE3
,1:GOTO 1400
1190 IF A$="N" THEN CLS:END
1200 GOTO 1180
1210 REM ***BONUS
1220 FOR Q=1 TO 3
1230 XX=45:YY=65:A$="BONUS BONUS":
DRAW"C4S8":GOSUB 2410
1240 EXEC 30100
1250 XX=45:YY=65:A$="BONUS BONUS":
DRAW"C1S8":GOSUB 2410
1260 NEXT Q
1270 BO=INT((6900-TI)/50)
1280 FOR T=1 TO BO
1290 SC=SC+1
1300 EXEC30100
1310 PUT(60,1)-(90,15),BB,PSET
1320 XX=60:YY=3:A$=STR$(SC):DRAW"C
2S8":GOSUB 2410
1330 NEXT T
1340 IF SC>HI THEN HI=SC:GOTO 1360
1350 GOTO 1080
1360 PUT(217,1)-(247,15),BB,PSET
1370 XX=215:YY=3:A$=STR$(HI):DRAW"
C2S8":GOSUB 2410
1380 GOTO 1080
1390 REM**GO AGAIN
1400 PCOPY 5 TO 1:PCOPY 6 TO 2:PCO
PY 7 TO 3:PCOPY 8 TO 4
1410 IF SC>HI THEN HI=SC
1420 DX=10:DY=165:SC=0:L=0:Z=0:R=3
3:LD=181
1430 TIMER=0
1440 GOTO 870
1450 REM**PICK UP LUNCH BOX
1460 IF L=0 THEN PUT(S,R)-(S+13,R+
5),NO,PSET:SOUND 250,3:PUT(S,R)-(S
+13,R+5),NL,PSET:R=R+5:PUT(60,1)-(
90,15),BB,PSET
1470 IF L=0 THEN SC=SC+10:XX=60:YY
=3:A$=STR$(SC):DRAW"C2S8":GOSUB 24
10
1480 PUT(DX,DY)-(DX+13,DY+21),BL,P
SET
1490 L=1:DX=25
1500 RETURN
1510 REM**DOWN LIFT
1520 PUT(DX,DY)-(DX+13,DY+21),BL,P
SET
1530 DX=DX+14
1540 PUT(DX,DY)-(DX+13,DY+21),SR,P
SET
1550 DY=DY+4
1560 PUT(DX,DY-4)-(DX+13,DY+17),BL
,PSET
1570 IF DY>=165 THEN 1590
1580 GOTO 1540
1590 IF DY>=165 THEN PUT(DX,DY)-(D
X+13,DY+21),BL,PSET:DX=DX-18:DY=16
5
1600 IF SC>0 AND L=1 THEN PUT(S,LD
)-(S+13,LD+4),LB,PSET:LD=LD-5:Z=1:
L=0:RETURN
1610 REM**MOVE RIGHT
1620 PUT(DX,DY)-(DX+13,DY+21),BL,P
SET
1630 DX=DX+8
1640 IF DX>=222 AND (DY+21)>58 THE
N DX=222
1650 IF DX>=222 AND (DY+21)<58 THE
N DX=226 :GOSUB 1520
1660 PUT(DX,DY)-(DX+13,DY+21),SR,P
SET
1670 IF PEEK(65280)=126 OR PEEK(65
280)=254 THEN 1700
1680 RETURN
1690 REM UP RIGHT
1700 PUT(DX,DY)-(DX+13,DY+21),BL,P
SET
1710 FOR T=0 TO 1:EXEC 30015:NEXT
T
1720 PUT(DX,DY-15)-(DX+13,DY+6),SR
,PSET
1730 IF PPOINT(DX+7,DY-18)<>1 THEN
 GOSUB 1040:PUT(DX,DY-15)-(DX+13,D
```

```
Y+6),BL,PSET:PUT(DX,DY)-(DX+13,DY+
21),SR,PSET:RETURN
1740 PUT(DX,DY)-(DX+13,DY+21),BL,P
SET
1750 DY=DY-15
1760 PUT(DX,DY-30)-(DX+13,DY-9),SR
,PSET
1770 PUT(DX,DY)-(DX+13,DY+21),BL,P
SET
1780 DY=DY-30
1790 RETURN
1800 REM MOVE LEFT
1810 PUT(DX,DY)-(DX+13,DY+21),BL,P
SET
1820 DX=DX-8:IF DX<=3 THEN DX=3
1830 IF Z=1 AND DY>144 AND  DX<=18
 THEN DX=18
1840 PUT(DX,DY)-(DX+13,DY+21),SL,P
SET
1850 IF PEEK(65280)=126 OR PEEK(65
280)=254 THEN 1870 ELSE RETURN
1860 REM UP LEFT
1870 PUT(DX,DY)-(DX+13,DY+21),BL,P
SET
1880 PUT(DX,DY-15)-(DX+13,DY+6),SL
,PSET
1890 FOR T=0 TO 1:EXEC 30015:NEXT
T
1900 IF PPOINT(DX+7,DY-18)<>1 OR P
POINT (DX+7,DY-23)<>1  THEN GOSUB
1040:PUT(DX,DY-15)-(DX+13,DY+6),BL
,PSET:PUT(DX,DY)-(DX+13,DY+21),SL,
PSET:RETURN
1910 PUT(DX,DY)-(DX+13,DY+21),BL,P
SET
1920 DY=DY-15
1930 PUT(DX,DY-30)-(DX+13,DY-9),SL
,PSET
1940 PUT(DX,DY)-(DX+13,DY+21),BL,P
SET
1950 DY=DY-30
1960 RETURN
1970 GOSUB 2100
1980 GET(5,0)-(18,21),SL,G
1990 PCLS:GET(5,0)-(18,21),BL,G
2000 GOSUB 2100
2010 GET(5,0)-(18,21),SR,G
2020 PCLS:GET(5,5)-(15,12),ML,G
2030 GOSUB 2100
2040 GET(0,0)-(13,5),NO,G
2050 PCLS:GET(0,0)-(13,5),NL,G
2060 GOSUB 2100
2070 GET(0,0)-(13,5),LB,G
2080 GOTO530
2090 REM GRAFICS
2100 PMODE 3,1:PCLS
2110 FOR N=0 TO 2
2120 A=1536+N
2130 FOR D=1 TO 24
2140 READ S:POKE A,S
2150 A=A+32
2160 NEXT D
2170 NEXT N
2180 RETURN
2190 DATA0,0,1,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0
2200 DATA 16,84,85,253,253,101,102
,153,85,85,85,150,20,20,20,20,20,2
0,20,84,84,4,0,0
2210 DATA 0,0,0,0,0,64,64,64,64,64
,64,64,64,0,0,0,0,0,0,0,0,0,0,0
2220 DATA 0,0,0,0,0,1,1,1,1,1,1,1,
1,0,0,0,0,0,0,0,0,0,0,0
2230 DATA 4,21,85,127,127,89,153,1
02,85,85,85,150,20,20,20,20,20,20,
20,21,21,16,0,0
2240 DATA 0,0,64,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0
2250 DATA 34,34,34,34,34,34,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2260 DATA 160,32,32,32,32,160,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2270 DATA 0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0
2280 DATA 5,21,101,106,85,85,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2290 DATA 0,64,144,144,80,80,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2300 DATA 0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0
2310 REM DRAW STRING ROUTINE
2320 DIM LE$(26)
2330 FOR K=0 TO 26:READ LE$(K):NEX
T
2340 FOR K=0 TO 9:READ NU$(K):NEXT
2350 DATA BR2,ND4R3D2NL3ND2BE2,ND4
R3DGNL2FDNL3BU4BR2,NR3D4R3BU4BR2,N
D4R2FD2GL2BE4BR,NR3D2NR2D2R3BU4BR2
2360 DATA NR3D2NR2D2BE4BR,NR3D4R3U
2LBE2BR,D4BR3U2NL3U2BR2,ND4BR2,BD4
REU3L2R3BR2,D2ND2NF2E2BR2
2370 DATA D4R3BU4BR2,ND4FREND4BR2,
ND4F3DU4BR2,NR3D4R3U4BR2,ND4R3D2NL
3BE2,NR3D4R3NHU4BR2
2380 DATA ND4R3D2L2F2BU4BR2,BD4R3U
2L3U2R3BR2,RND4RBR2,D4R2U4BR2,D3FE
U3BR2,D4EFU4BR2
2390 DATA DF2DBL2UE2UBR2,DFND2EUBR
2,R3G3DR3BU4BR2
2400 DATA NR2D4R2U4BR2,BDEND4BR2,R
2D2L2D2R2BU4BR2,NR2BD2NR2BD2R2U4BR
2,D2R2D2U4BR2,NR2D2R2D2L2BE4,D4R2U
2L2BE2BR2,R2ND4BR2,NR2D4R2U2NL2U2B
R2,NR2D2R2D2U4BR2
2410 DRAW"BM"+STR$(XX)+","+STR$(YY)
2420 FOR K=1 TO LEN(A$)
2430 B$=MID$(A$,K,1)
2440 IF B$>="0" AND B$<="9" THEN D
RAW NU$(VAL(B$)):GOTO 2470
2450 IF B$=" " THEN N=0 ELSE N=ASC
(B$)-64
2460 DRAW LE$(N)
2470 NEXT
2480 RETURN
```

■

Dragonsoft

New software for review should be sent to *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Jet Set Willy

Program: *Jet Set Willy*, Software Projects, Bearbrand Complex, Allerton Road, Woolton, Liverpool, 25 7SF. **Price:** £7.95

I HAVE never before felt the compulsive urge to rave about a game to everybody, but now . . .

Jet Set Willy, is simply the best thing since *The King*. In fact, it's better. The game is a work of art, and epic, and any other great praise that I can think of.

There are several reasons for buying this game. It is a better follow up the brilliant *Manic Miner* than anyone could have assumed possible. It is challenging, combining beautiful elements of adventure (strategy and planning) and arcade (simple controls, everything graphical). The graphics are the best I have ever seen in PMODE 4; there is one Demon who is simply brilliant. It gives a great chance to gloat at your Spectrum owning friends. Ring them up and invite then round to play the game. When they arrive have the game already loaded but leave the title page



going, allowing them to see the joystick option (STRIKE ONE). Start playing and soon they will pipe up with "But it's only in Black and White!! That's not up to much is it?"

At this point proceed to "The Guest Room", "The Games Room", and the rest of the fifteen extra rooms that the Dragon version has, being careful to point out that these rooms have all been fitted into 32K as opposed to the 48K it took to write their smaller version.

Take them to lie down somewhere — due to the small size of their brains, which have been numbed by the fact they haven't programmed anything since they bought their Spectrum, they will almost definitely be frustrated and confused.

If we all buy this one, then Software Projects will write another one, and another one, and another one . . .

There's no point in trying to copy it, it contains the best set of anti-piracy devices I have ever seen (including a chart that would surely take months to copy out!!).

The game has one annoying bug — when the player dies the new life starts at the place that the old one finished, which can occasionally be directly under a creature (ie chainsaw, mad monk, giant, ice-cream, spinning razor, silicon chip, etc . . .), causing the loss of all eight lives (yes, you need them all!!).

If you don't have a copy of *Hunchback* then don't panic, you'll find four screens from it on the roof of the house, along with lovely screen names one of which sounds like an extract from *Jabberwocky*, but isn't!

What else can I say? Beg, steal, borrow, do anything but get enough money for this game . . . you will never regret it.

Jason Orbaum



Syzygy

Program: *Syzygy*, Microdeal, 41 Truro Road, St Austell, Cornwall. **Price:** £8.00

IF NOTHING else, this qualifies as the software with the silliest title, though it does offer a little more than that — in fact 250 pictures which cover 300 locations in an attempt to produce a kind of graphics adventure. The setting is the Deathstar where you are trapped with one Dark Lord Vader, who sounds vaguely familiar. You don't want to get too familiar with him, though, as if you encounter him you can be sure he won't be offering you cups of tea and cucumber sandwiches. You need your Light Saber to see him off, and to do that you need to find something that will deal with the 'orrible alien that's guarding it.

As you can see, the adventure elements are here, and the graphics side comprises, for the most part, a 3-D maze of corridors and doors a little like Salamander's *Red Meanies* or Microdeal's own earlier *Phantom Slayer*. The pictures, which are simple but convincingly done, take up one quarter of the screen, leaving room for an inventory alongside with the bottom half of the screen given over to the text. You move along the corridors using the up arrow key, and turn with the left and right arrows, movement being instantaneous and very impressive. Doors open automatically when you come to them . . . which is not necessarily a good thing as some lead to instant death as you may step into a lift that's guarded by some kind of force field, or into another corridor where there's no air. The spacesuit I've found has holes in it, and this didn't do me a great deal of good. Another door leads to a room with a pool in it, so I tried EXAMINE POOL to be given the helpful information "It's wet." I'd also apparently forgotten how to swim so that wasn't a great success either.

There are plenty of other rooms to explore, and objects to slowly amass, and despite the difficulty of mapping out the maze of corridors which all look so similar, I liked the blend of graphics and adventure — not the easiest thing to do on the Dragon, and by simplifying the graphics they can squeeze in a vocabulary of 62 words. Not bad, and as long as you don't expect a conventional adventure *Syzygy* shouldn't disappoint.

Mike Gerrard



Jigsaw

Program: *Jigsaw*, Vidipix, 125 Occupation Road, Corby, Northants. **Price:** £3.95

VIDIPIX is a name new to me amongst Dragon software companies. Even if they have been around for quite a long time, I do not see their chances of survival for much longer as being very high.

The fault with this piece of software is the same as that of so many that we reviewers receive; the programming quality may be of a very high standard, but the idea is simply unworkable.

The programming in this game is superb (excluding the bugs mentioned below) but the game suffers from the fact that there are very few people who want to use a computer to do a jigsaw, even one of their own design!

So, what do you receive for your money when you buy this 'game'? Basically (Pun intended — the program is mainly in BASIC), you get three routines, a jigsaw routine, a very simple drawing routine, and a screen dump routine for a fair selection of printers.

The jigsaw routine is the main part of the program. This takes the graphic screen and divides it up into squares (no, not jigsaw like pieces, just identical squares) and you have to get them into the right places to complete the jigsaw.

The drawing program has several bugs, not least of which is the program's seeming inability to allow you to, move the cursor, despite following the clear instruction to the letter.

If you don't like jigsaws, or you don't like computer logic games, then steer clear of this game. If you like both, then steer clear of this game.

It is a shame that I have to write such a scathing review as the programing is really rather good at points, but I'm afraid Vidipix need a new designer, preferably one who knows something about market demand.

Jason Orbaum



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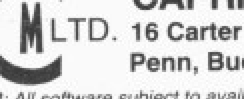
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YET ANOTHER international postbag this month, headed by Moshe Reuveni of Gordon 40, Givataim 53227, Israel, who apologises for his poor English, though not so poor he hasn't been able to finish off *Black Sanctum,* on which he offers a few clues, including what to do with the door that's boarded up (clues being printed backwards): REM MAHWA LC HTIW LIAN LLUP. Thanks for that clue, Moshe, and I can assure you that your English is much better than my Hebrew.

Mind you, I think even my Hebrew is better than my Norwegian, so just as well reader Robert Bruvik of Skalevikneset in Norway speaks good English, too. Now Norway might be famous for fjords and parrots, but vampires are a little thin on the ground so Robert's having trouble getting out of Level One of *Transylvanian Tower* from Richard Shepherd. I've asked Robert to be a bit more specific as this 3-D graphics maze can be negotiated with a mixture of plotting and plodding . . . though only to the even harder second level. I made it to the top of the tower but the creepy Count saw me off with no bother. If all else fails I shall hand Robert over to the man with the garlic, Richard Shepherd himself.

A recent letter from Touchmaster confirmed that they'll soon be extending their range to take in the Adventure International "Mysterious Adventures" series, recently taken over by A I from Channel 8, with a welcome reduction in price at the same time to £7.95. Touchmaster will also be handling adventure titles from smaller software houses, such as Nemesis's *The Trial of Arnold Blackwood,* an adventure I do recommend, and if you've sampled the Arnold style of humour and liked it then you'll be pleased to hear that Nemesis is currently converting another from the Amstrad to the Dragon. More details when it's been done.

Ian High of 62 Littlemede, Eltham, London SE9, offers help to anyone with the Dan Diamond trilogy or *Ring of Darkness,* though he himself can't get out of the cabin in *Black Spectrum.* He says he's broken the mirror several times, to no effect, and can't think of any other possible exit. My advice is: DAETSNIR ORRI MOGO TYRT. Letters from Ian and others show that there's no such thing as an easy or difficult adventure, because what puzzles one person seems to be a doddle to someone else, while another title might have the opposite effect.

A common problem is how to cross the water and the mountains in *Ring of Darkness,* which I'm asked this month by Wesley Curtis of 4 Kings Drive, Gravesend, Kent DA12 5BG. Wesley should obviously write to Ian High, while two lesser-known adventures are puzzling Quentin Watt: *Poseidon* and *Castle of Doom.* In the former Quentin's on a ledge with a rope but can't make use of it, while in the latter he's having trouble with the monster. Typical adventurer's troubles, so if you can help Quentin out write to him at Glen Esk, East Cowton, Northallerton, North Yorkshire.

Yes, the scrapes we adventurers get ourselves into. Gillian Brigham sounds like quite a straightforward person, living at the typically English address of "Ingleborough", Ash Tree Close, Southwell, Notts, and yet here she is chasing secret agents in her spare time, thanks to *Operation Safras* from Shards. Gillian has managed to rescue the agent in Manchester, and earned herself lots of money in Southampton (no, nothing to do with all those sailors there), but she's stuck on the following: Where to find the code for the Welsh computer in Dundee; where to find the antidote for the agent in Plymouth; where to find the one who is deaf, dumb and blind; where to find the son of the agent in a certain university town; and how to enter the shed near York Minster without being blown up. And you thought you had problems. If you can help Gillian with hers then contact her at the address above.

Philip Blazdell of Jail Lane in Biggin Hill, an appropriate address for an adventure player, thinks I ought to be writing four pages every month, including a full-page adventure helpline. Well I'm very flattered, but it might be hard to fill four pages every month on Dragon adventures, though I used Philip's letter to DROP HINT to the editor, who has agreed to extra space when possible. Philip also kindly sent me a copy of Dragon Data's help sheet on *Madness and the Minotaur,* which in fact is of limited help but I will happily pass a copy on to anyone who wants it *provided* they enclose s.a.e.

Having dealt with several old problems, on to an adventure that's sure to create some new ones, and that's *Caverns of Doom* from Microdeal, a machine code text-only adventure of over 100 locations, being sold at the low price of £4.99, though that's no reflection at all on its quality. The story is that you are in a network of tunnels in a mine complex, and all you have to so is find your way out. You begin just inside the entrance, with the south tunnel behind you collapsed and your only safe route being to the north. A seasoned adventurer never goes anywhere without having a quick INVENTORY, and this reveals you to be carrying a flashlight. At least we won't have to waste time looking for our old friend, the torch. The screen is split into three sections, the top two-thirds being description, what you can see plus inventory, and at the bottom right is a mini-compass which displays your available exits — a neat idea. Alongside that is room for your inputs and the responses.

Venturing into the mine proved at least one of my assumptions wrong straight away, for in a small one-room prospector's shack is a tool chest, a jar, a broken lamp and an oil drum. Obviously the flashlight isn't going to last forever, so how do we fix the lamp? The tool chest is locked, so perhaps there's a key in the jar EXAMINE JAR. "It contains: pickles." So much for that, though I did try pickling the lock just in case. In a dead-end I found some beams, which cheered me up, and elsewhere a skeleton, which didn't . . . well, not at first. Further tramping around uncovered some other familiar objects, the good old rope and the good old matches for instance, along with signs that an earlier object was the good old red herring — no, not a pickled herring. By now I was running out of hands, and my flashlight was growing dim, then before you knew it: total darkness. We all know what happens if you move round in the dark, too, don't we? Wrong again! Here you can continue to move, so if your map is accurate survival might be possible, as indeed might a little more light.

For a fiver *Caverns of Doom* is definitely worth grabbing, with its quite extensive vocabulary, SAVE and LOAD routines, GET EVERYTHING and DROP EVERYTHING commands, SCORE (out of 80) and an inventory that actually takes account of the weights of different objects. Let's just hope I can get a good way into the caverns. ■

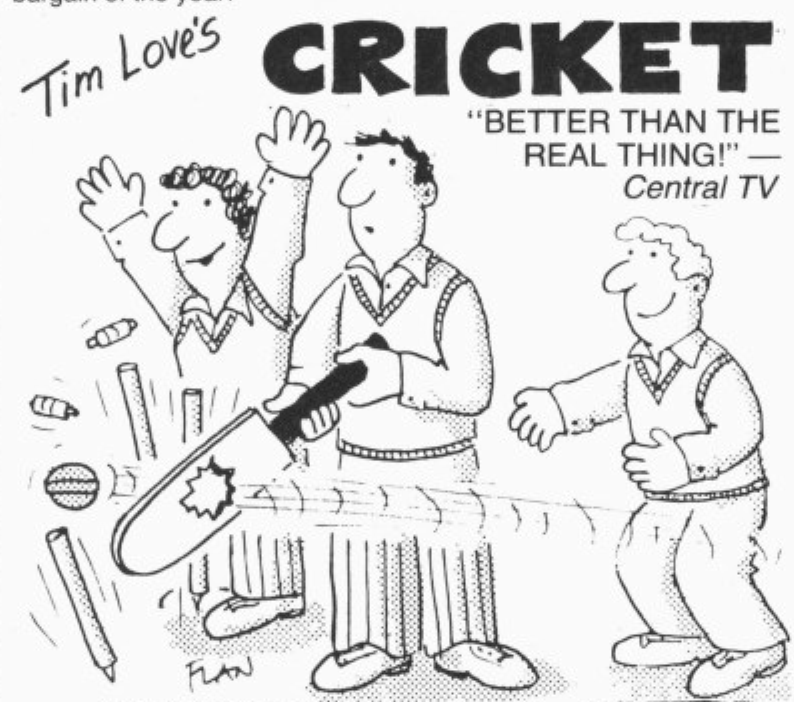
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Dragon Answers

Oh Brother!

CAN I connect a Dragon 64 to a Brother EP-22 Typewriter printer via the RS232 ports (that is do they both have the same standard)?

K S Hoskins
Romford

I CAN'T see any problems in connecting the RS232 ports together, providing you can obtain, or make a suitable lead. You will need to set up the baud rate of the Dragon's port to the correct value, given in the printers manual. Use the POKE given in the Dragon 64 supplement. To print out on the RS232 port, rather than the centronics port, type POKE 1023,1. You may also need to type POKE 330,2, if the printer does not linefeed correctly.

SN error

I'VE GOT a Dragon 64 and recently I bought a game called *Tim Love's Cricket* by Peaksoft. After loading it I got an SN error line 9620. On this line there is a user statement. Could you please tell me how to correct this line?

Kamran Hussain
Bradford

THIS HAS come up before, but again a number of letters have come in regarding this problem on various games running on the 64, written for the 32. The syntax error is caused by the line having an extra character in the user number — eg X=USR01(A). This was necessary on the 32 but on the 64 it should read X=USR1(A). You can simply edit the offending line and re-run the program in most cases.

Software programmers might like to use the following lines to test whether the program is running on a 64 or a 32.

```
100 VER$=CHR$(PEEK(49052))
+CHR$(PEEK(49053))
110 IF VER$="64" THEN (Dragon
64) ELSE (Dragon 32)
```

INKEY

I WOULD like to find out properly how to enter the keyboard arrow keys. I know that it has something to do with INKEY but would like to know if there are any standard lines for all programs.

V Edwards
Port Talbot



THE FOLLOWING few lines can be inserted to check for the four arrow keys; the command following the THEN could either be a goto or a direct command(s) to handle the key press.

```
100 IF INKEY$=CHR$(8) THEN left
arrow pressed
110 IF INKEY$=CHR$(9) THEN right
arrow pressed
120 IF INKEY$=CHR$(10) THEN
down arrow pressed
130 IF INKEY$=CHR$(94) THEN up
arrow pressed
```

You can also check for the arrow keys plus shift being pressed by substituting these numbers in the above CHR$ statements, 21, 93, 91, 95.

Double up

I HAVE a Dragon Data Single disk drive and I would like to ask you if you could possibly suggest somewhere that I could have a second drive fitted to it.

Ideally I would like to have the upgrade done as soon as possible as I am constantly using the Disk for Word Processing and the like.

Paul Grieves
Deeside
Clwyd

COMPUSENSE, the new Dragon distributors can supply a second disk drive upgrade kit for £120. Fitting a second drive is a simple enough task for just about anyone at home with a screwdriver. It just involves removing the cover from the drive and putting two plugs into the second drive, it requires no soldering.

?FM error

I AM having trouble with a Basic program that was saved to tape using EXEC46756. As it was a basic program, I tried to CLOAD it. This, and CLOADM, resulted in an ?FM ERROR. Trying to load it as a file also failed. Could you tell me how to load it as it is the only copy of the program I have?

Robert Gooding
Irvine
Ayrshire

I AM afraid the program has probably been saved incorrectly, as the correct address for the Basic save routine is 46757, not 46756. You could use the following assembly routine to load in the file as it was saved, and providing the Basic is not corrupted, you can then save the file using CSAVE. It is never a good idea to use ROM routines to do things like save programs when the CSAVE command is adequate.

```
JSR [$A004] ;READY FOR INPUT
LDX #474
STX 126
JSR [$A006] ;GET HEADER
LDX 25
LOOP STX 126
PSHS X
JSR [$A006] ;READ A BLOCK
PULS X
LDA 124
INCA
BEQ EOF
LEAX 255,X
BRA LOOP
EOF LDX 126
LEAX -1,X
STX 27
JSR 33823
JSR 33773
RTS
```

Semigraphics

COULD you please inform me how to obtain the additional screen graphic modes not supported by Dragon Basic by poking, as I don't possess an assembler.

Ian Lett
16 Whalebone Avenue
Romford RM6 6DA

IT WOULD take up most of this page to describe all the additional graphic modes which the VDG is capable of, but which Basic does not support. However, a mode called Semi-Graphics 24 is generally regarded as the most useful and is described here. The mode allows all nine colours to be used, as well as text and 64 by 192 graphics. The simplest way to enter this mode from Basic is with the following lines:

```
10 PMODE 4,1:SCREEN 1,0 'Use
Basic to set up VDG start adrs etc.
20 POKE &HFF22,5
30 POKE &HFFC0,0:POKE
&HFFC3,0:POKE &HFFC5,0
```

The pokes in line 30 are not actually necessary with the PMODE 4 statement, but are included for completeness. All access to this mode must be by poking to the screen (starting at 1536), Basic cannot print or plot on the screen in this mode. You might like to take a look at a program called Masterstroke II, which adds commands to the basic to control some of these extra modes, details from PikaDee Software, 35 Parker Street, Preston, Lancs PR2 2AH.

SAVE""

I HAVE had my Dragon Dos since Christmas. When saving one of my best programs, I accidentally pressed enter when only typing SAVE. I have found a way to load it but not to kill it. Can you help?

Simon Buxton
75 Queens Road North
Eastwood
Nottingham NG16 3BJ

IT IS an interesting point you have raised here. The only way to kill off a program saved with SAVE"" is to change its name by direct access to the directory track — track 20. If you do attempt this using SREAD and SWRITE I suggest you use a backup copy of the disk as one mistake could corrupt the directory and lose all your files. What you really need is a 'Disk Doctor' type program, but I have yet to see one for Dragondos.

It is worth noting that programs saved with SAVE"" can be loaded and run, but effectively not killed. This does have its uses.

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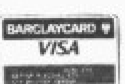
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ADVERTISERS INDEX

Enter competition or Hulk smash!

Gordon Lee sets the competition, Adventure International provide the prizes

READERS who regularly attempt the competition in *Dragon User* will have found instances where the standard mathematical function of the Dragon is inadequate. For example, in the March competition it was necessary to compute the exact value of factorial 52, and the following month the solution relied on calculating successive powers of 2 and 5 accurately in order to determine which of these powers contained any zeros.

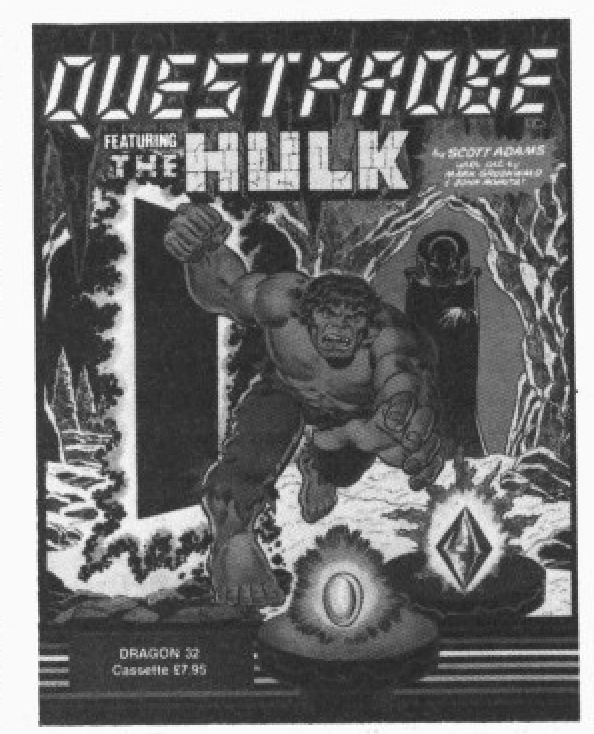
In the case of the powers of 5, to obtain the values up to 5^{100} it is clearly not sufficient to write a program such as:

```
10 LET T=1
20 FOR N=1 TO 100
30 LET T=T*5
40 PRINT T
50 NEXT N
```

If this program were to be run it would work satisfactorily for a few steps and then two things would happen. Firstly, when N reached a value of 13 the computed value of T would be given as 1.22070313E+09. This is due to the computer switching to an exponential form of notation now that the value being handled has exceeded nine digits — in other words, is greater than 999999999.

The second thing that will happen if the program is left to run is that an OV (overflow) error will occur after step 54, due to the number being calculated being too large for the computer to handle. We also have the additional problem that the computer is also only able to hold a dozen or so significant digits in the calculation, and so although it keeps a record of the absolute *magnitude* of the number, the precise value of the minor digits is lost for ever. It is a sad fact that the mathematical capability of the *Dragon* (and other micros) is little better than that of a cheap pocket calculator!

However, rather than admit defeat, we can easily devise a method to overcome the difficulty. In the case of the problem mentioned, the full value of the powers of 5 up to 5^{100} can be handled using the program listing given. A quick examination of this listing should make its mode of operation clear. Note how the powers of 5 are stored in *strings* rather than as numeric variables, which, as has been shown, are inadequate for numbers of this magnititude. Each *digit* is the extracted in turn from the string, a simple mathematical operation performed, and the resulting value returned to string form. Note the use of the 'Carry' variable, where necessary. In this way the full value of 5^{100} with its 70 digits is easily manageable, and there is no reason why even greater powers could not be calculated by modifying the program to accommodate hundreds, or even thousands, of digits. One way would be to utilise a string array, each variable containing, say, 250 digits.



This month's competition is to devise a program along the lines of the one already mentioned, which will compute *square roots.* The program should allow an input of any number of up to nine digits, and should be able to calculate the square root of that number to a high degree of accuracy, the limitations only being the amount of memory available for storing the numbers generated. The length of time that the calculation takes will also, presumably, have a bearing on the extent to which the computation can be carried out.

The method of calculation chosen should be at the competitor's own choice, and should be outlined briefly. The program should be written in BASIC and a full listing enclosed, together with an attached list of program notes, where appropriate. Apart from accuracy, which will be tested for by calculating a known value, entries will be assessed for brevity, clarity, and speed of operation.

Good luck!

Prize

THIS MONTH'S prize is something rather special — the person who sends in the best solution, in the opinion of our quiz expert Gordon Lee, will win not one but 15 games!

Adventure International are donating one copy of each of the Scott Adams adventures as a prize for the most perspicacious participant — that's Classic Adventures 1 to 13 inclusive, plus *Spiderman* and *The Hulk.*

In addition, the 25 runners-up will be receiving a copy of Classic Adventure 13 — *Claymorgue Castle.*

That's a grand total of 40 games to be won!

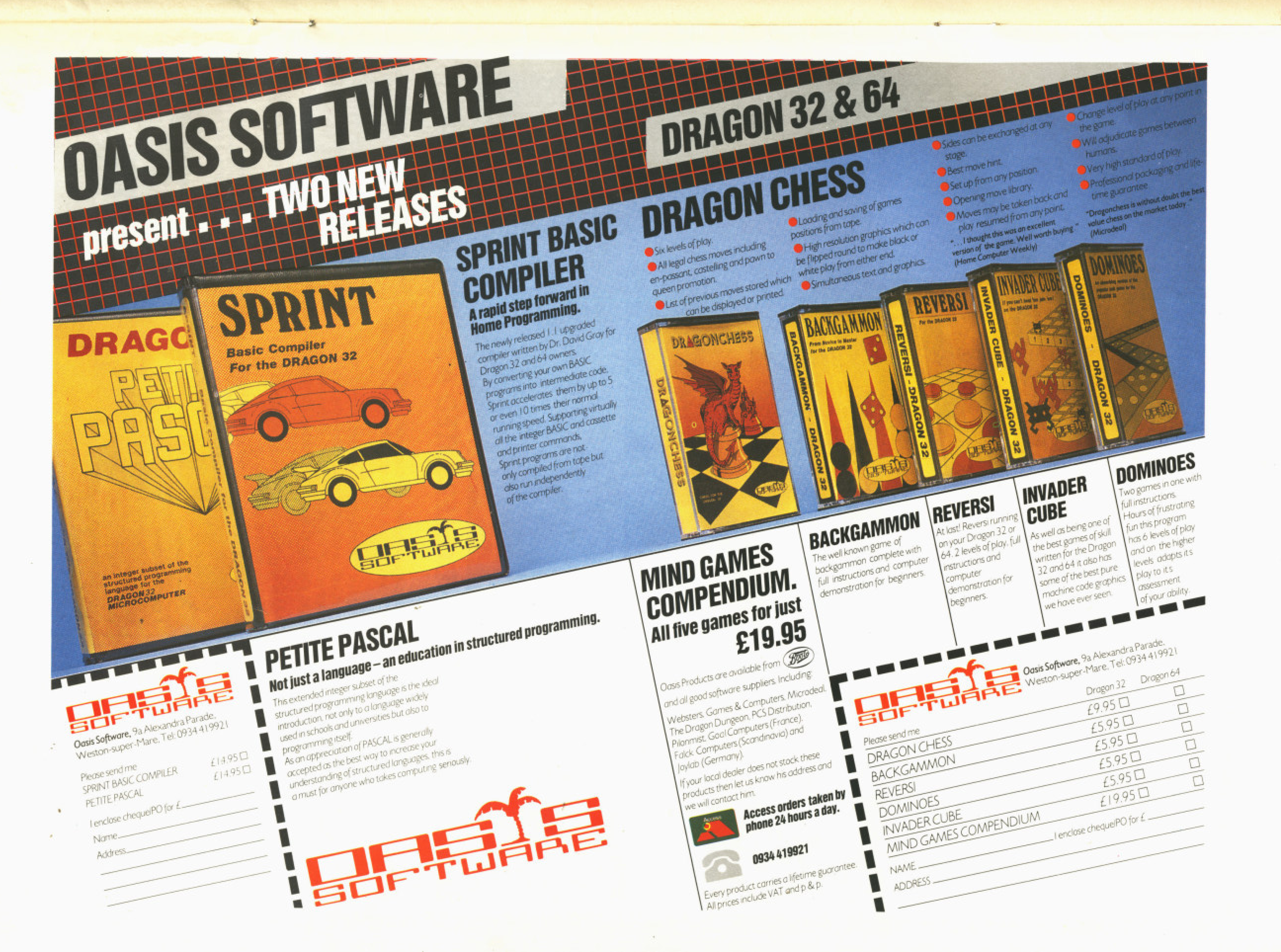
Rules

ENTRIES for this competition should be clearly marked Competition Corner June on the envelope, and should include your name and address in block capitals.

Your entry must arrive at Dragon User by the last working day in June. The winners will be named in the September issue of the magazine.

March Winners

THE WINNERS of our March competition were Zhiwei Chen of Bristol, Steve Worsley of Ilford, Raymond Woods of Barkingside, M. Leyland of Grantham, C. Jones of Llanerch, T. Potter of Chisledon, Robin Telkman of Sale, Ian Mitchell of Llanfairpwll (etc), P. Beaumont of Largs, M. Fecher of Maidenhead, Ned Skelton of Thornbury, Steve Hailes of Croftfoot, J. Hewitt of Hixon, P. Bennington of Strood, and H. van Gestel of the Netherlands. Each of them will be receiving a copy of Microdeal's *Worlds of Flight.*



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